This document gives pertinent information concerning the reissuance of the VPDES Permit listed below. This permit is being processed as a Major, Municipal permit. The discharge results from the operation of a 0.715 MGD wastewater treatment plant that is under construction to expand to 2.0 MGD. This permit action consists of updating the proposed effluent limits to reflect the current Virginia WQS (effective January 6, 2011) and updating permit language as appropriate. The effluent limitations and special conditions contained in this permit will maintain the Water Quality Standards of 9VAC25-260-00 et seq.

1.	Facility Name and Mailing Address:	Wilderness WWTP P.O. Box 148 Ruckersville, VA 22968	SIC Code :	4952 WWTP
	Facility Location:	36075 Wilderness Shores Way Locust Grove, VA 22508	County:	Orange
	Facility Contact Name:	Tim Clemmons	Telephone Number:	(434)985-7811
2.	Permit No.:	VA0083411	Expiration Date of previous permit:	7/31/2011
	Other VPDES Permits associated with this facility:		VAN020029	
	Other Permits associated with this facility:		None	
	E2/E3/E4 Status:	Not Applicable		
3.	Owner Name:	Rapidan Service Authority		
	Owner Contact/Title:	Dudley Pattie, General Manager	Telephone Number:	(434)985-7811
4.	Application Complete Date:	March 24, 2011		
	Permit Drafted By:	Alison Thompson	Date Drafted:	April 4, 2011
	Permit Revised By:	Alison Thompson	Date Revised:	July 13, 2011
	Draft Permit Reviewed By:	Joan Crowther	Date Reviewed:	April 8, 2011
	WPM Review:	Bryant Thomas	Date Reviewed:	April 25, 2011
	Public Comment Period :	Start Date: 7/14/2011	End Date:	8/15/2011

5. Receiving Waters Information: See Attachment 1 for the Flow Frequency Determination

Receiving Stream Name :	Rapidan River		
Drainage Area at Outfall:	640 sq.mi.	River Mile:	RAP010.2
Stream Basin:	Rappahannock River	Subbasin:	Not Applicable
Section:	4	Stream Class:	III
Special Standards:	None	Waterbody ID:	VAN-E18R
7Q10 Low Flow:	12 MGD	7Q10 High Flow:	76 MGD (Dec-May)
1Q10 Low Flow:	7.6 MGD	1Q10 High Flow:	55.7 MGD (Dec-May)
Harmonic Mean Flow:	139 MGD	30Q5 Flow:	36.6 MGD
303(d) Listed:	Yes	30Q10 Flow:	21.7 MGD
TMDL Approved:	Yes	Date TMDL Approved:	12/5/2007 Bacteria

6. Statutory or Regulatory Basis for Special Conditions and Effluent Limitations:

- ✓ State Water Control Law
- ✓ Clean Water Act
- ✓ VPDES Permit Regulation
- ✓ EPA NPDES Regulation
- ✓ EPA Guidelines
- ✓ Water Quality Standards
- ___ Other

7. Licensed Operator Requirements: Class I

8. Reliability Class: Class I

9. Permit Characterization:

___ Private	___ Effluent Limited	___ Possible Interstate Effect
___ Federal	✓ Water Quality Limited	___ Compliance Schedule Required
___ State	✓ Toxics Monitoring Program Required	___ Interim Limits in Permit
✓ POTW	✓ Pretreatment Program Required	___ Interim Limits in Other Document
✓ TMDL		

10. Wastewater Sources and Treatment Description:

The facility currently has a CTO for the 0.715 MGD design flow. The influent to the Wilderness WWTP is screened prior to the influent flow measurement. The wastewater is treated in a quadriplex concentric oxidation ditch operated in extended aeration mode. The oxidation ditch is followed by two secondary clarifiers. Chlorination of the clarified water is done with gaseous chlorine. Dechlorination is accomplished by sulfur dioxide gas. The effluent flows down a cascade aerator to the Rapidan River.

The facility is in the final stages of the expansion to 2.0 MGD; as of late June, the new unit processes have been brought online to begin testing before the issuance of the Certificate to Operate. The upgraded facility will utilize a 5-stage modified Bardenpho process coupled with chemical addition followed by tertiary filtration to achieve state-of-the-art nutrient removal limitations. The facility will continue to use chlorination for disinfection.

See Attachment 2 for a facility schematic/diagram.

TABLE 1 – Outfall Description

Outfall Number	Discharge Sources	Treatment	Design Flow	Outfall Latitude and Longitude
001	Domestic and/or Commercial	See Item 10 above.	0.715 and 2.0 MGD flow tiers	38°22'30" 77°44'45"
The discharge location is identified on the attached USGS topographic map – Richardsville (discharge location), Germanna Bridge, Chancellorsville, and Mine Run Quadrangles (Attachment 3).				

11. Sludge Treatment and Disposal Methods:

The Wilderness WWTP aerobically digests the sludge and uses polymer to thicken the waste sludge prior to dewatering with a filter press. The dewatered solids are land applied through a contractor.

12. Discharges, Intakes, Monitoring Stations, Other Items in Vicinity of Discharge:

TABLE 2	
VA0021385	Orange STP discharge to Rapidan River at river mile 46.3
VA0027839	Woodberry Forest School STP discharge to Rapidan River at river mile 42.39
3-RAP006.53	DEQ's Ambient Water Quality Monitoring Station located on Rapidan River at the Route 610 bridge.

The Rapidan Service Authority Water Treatment Plant's intake is located upstream of the WWTP's discharge point. Withdrawals from the river are governed by VWP Permit No. 96-0271. The permit provides for a maximum daily withdraw rate from the Rapidan River of 2.0 MGD with a maximum instantaneous withdrawal rate of 2083 gallons per minute.

13. Material Storage:

TABLE 3 - Material Storage		
Materials Description	Volume Stored	Spill Prevention Measures
Zetag 7687 Polymer	2- 55 gallon drums	Stored indoors
Chlorine gas 150# cylinders	6-9 full cylinders	Stored indoors, chained in place
Sulfur Dioxide 150# gas cylinders	6-9 full cylinders	Stored indoors, chained in place
Soda Ash	2 pallets (use 8 bags/day)	Stored indoors
Caustic Soda	2 drums	Stored indoors
Sodium Hypochlorite	6 drums	Stored indoors
Calcium Hypochlorite	100 pounds	Stored indoors
Pearlite (filter aid)	820 bags	Stored indoors
Diesel Fuel for the generator	500 gallons	None

14. Site Inspection:

Performed by Alison Thompson on March 4, 2011 (Attachment 4).

15. Receiving Stream Water Quality and Water Quality Standards:

a) Ambient Water Quality Data

Although the direct receiving segment of the Rapidan River is not monitored, there is monitoring data for a downstream segment located 2.8 miles downstream of Outfall 001. The nearest downstream monitoring station is 3-RAP006.53, which is located approximately 3.8 miles downstream of Outfall 001, at the Rt. 610 bridge crossing. DEQ uses this station for ambient, biological, and fish tissue/sediment monitoring. There is also a DEQ sediment station 3-RAP006.49, just downstream from the Route 610 bridge crossing and a citizen monitoring station 3RAP-C14-SOS. The following is a summary for this segment of the Rapidan River, as taken from the 2010 Integrated Report:

> *E. coli* monitoring finds a bacterial impairment, resulting in an impaired classification for the recreation use. Citizen monitoring finds a medium probability of adverse conditions for biota; however, DEQ biological monitoring at upstream and downstream locations indicate that the benthic community is not impaired. The aquatic life use is considered fully supporting, but noted for observed effect for total phosphorus. The wildlife use is considered fully supporting.

The fish consumption use is impaired for mercury in fish tissue. Three excursions above the fish tissue value (TV) of 300 parts per billion (ppb) for mercury (Hg) in fish tissue was recorded in three species of fish (3 total samples) collected in 2006 at monitoring station 3-RAP006.53 (American eel, rock bass, smallmouth bass).

Significant portions of the Chesapeake Bay and its tributaries are listed as impaired on Virginia's 303(d) list of impaired waters for not meeting the aquatic life use support goal, and the 2010 Virginia Water Quality Assessment 305(b)/303(d) Integrated Report indicates that much of the mainstem Bay does not fully support this use support goal under Virginia's Water Quality Assessment guidelines. Nutrient enrichment is cited as one of the primary causes of impairment. EPA issued the Bay TMDL on December 29, 2010. It was based, in part, on the Watershed Implementation Plans developed by the Bay watershed states and the District of Columbia.

The Chesapeake Bay TMDL addresses all segments of the Bay and its tidal tributaries that are on the impaired waters list. As with all TMDLs, a maximum aggregate watershed pollutant loading necessary to achieve the Chesapeake Bay's water quality standards has been identified. This aggregate watershed loading is divided among the Bay states and their major tributary basins, as well as by major source categories [wastewater, urban storm water, onsite/septic agriculture, air deposition]. Fact Sheet Section 17.e provides additional information on specific nutrient limitations for this facility to implement the provisions of the Chesapeake Bay TMDL.

The full planning statement can be found in the reissuance file.

b) Receiving Stream Water Quality Criteria

Part IX of 9VAC25-260(360-550) designates classes and special standards applicable to defined Virginia river basins and sections. The receiving stream, Rapidan River, is located within Section 4 of the Rappahannock River Basin, and classified as a Class III water.

At all times, Class III waters must achieve a dissolved oxygen (D.O.) of 4.0 mg/L or greater, a daily average D.O. of 5.0 mg/L or greater, a temperature that does not exceed 32°C, and maintain a pH of 6.0-9.0 standard units (S.U.).

Attachment 5 details other water quality criteria applicable to the receiving stream at each of the flow tiers.

Ammonia:
The fresh water, aquatic life Water Quality Criteria for Ammonia are dependent on the in-stream temperature and pH. The 90th percentile temperature and pH values are used because they best represent the critical design conditions of the receiving stream. Ambient water quality data for pH and temperature used during the last reissuance were compared to recent data available from DEQ monitoring. There were no significant differences, so the 90th percentile values from the last reissuance will be carried forward. The effluent pH and temperature values will also be carried forward; the current design of the facility has not changed. Staff will re-evaluate pH and temperature during the next reissuance since the expanded facility will have been placed online. The ammonia criteria are presented in Attachment 5 for each flow tier.

Metals Criteria:
The Water Quality Criteria for some metals are dependent on the receiving stream's hardness (expressed as mg/l calcium carbonate). The average hardness of the receiving stream at monitoring station RAP006.53 is 24.92 mg/L; a summary of the data is in the permit file. The total hardness of the effluent from the existing facility on February 3, 2011 was 54.7 mg/L. The expanded facility will feed magnesium hydroxide to add alkalinity for the removal of Total Nitrogen. Eighteen total hardness effluent data points have been generated by the expanded facility. The data can be found in Attachment 10. The average of these values is 100 mg/L calcium carbonate. DEQ reran MSTRANTI with this new total hardness data. The revised calculations are found in Attachment 5 for the 2 MGD facility.

Bacteria Criteria: The Virginia Water Quality Standards (9VAC25-260-170 A.) states that the following criteria shall apply to protect primary recreational uses in surface waters:

1) *E. coli* bacteria per 100 ml of water shall not exceed a monthly geometric mean of the following:

	Geometric Mean[1]
Freshwater *E. coli* (N/100 ml)	126

[1]For a minimum of four weekly samples [taken during any calendar month].

c) Receiving Stream Special Standards

The State Water Control Board's Water Quality Standards, River Basin Section Tables (9VAC25-260-360, 370 and 380) designates the river basins, sections, classes, and special standards for surface waters of the Commonwealth of Virginia. The receiving stream, Rapidan River, is located within Section 4 of the Rappahannock Basin. This section has been designated with no special standards.

d) Threatened or Endangered Species

The Virginia DGIF Fish and Wildlife Information System Database was searched on March 29, 2011 for records to determine if there are threatened or endangered species in the vicinity of the discharge. No threatened or endangered species were identified. The search has been placed in the reissuance file. The limits proposed in this draft permit are protective of the Virginia Water Quality Standards and protect the threatened and endangered species found near the discharge. The stream that the facility discharges to is within a reach identified as having an Anadromous Fish Use. It is staff's best professional judgment that the proposed limits are protective of this use.

16. Antidegradation (9VAC25-260-30):

All state surface waters are provided one of three levels of antidegradation protection. For Tier 1 or existing use protection, existing uses of the water body and the water quality to protect these uses must be maintained. Tier 2 water bodies have water quality that is better than the water quality standards. Significant lowering of the water quality of Tier 2 waters is not allowed without an evaluation of the economic and social impacts. Tier 3 water bodies are exceptional waters and are so designated by regulatory amendment. The antidegradation policy prohibits new or expanded discharges into exceptional waters.

The receiving stream was classified as Tier 2 during the last reissuance based on a review of ambient water quality monitoring data for toxic parameters. A review of the current ambient monitoring data provides no basis to change the determination; therefore, for the purpose of deriving effluent limits for this permit, the receiving stream in the vicinity of the discharge will again be considered Tier 2. Staff has made no attempt to define boundaries or imply any other use of this determination. The decision to call the stream Tier 2 is in keeping with DEQ's general conservative approach to preparing VPDES permits. No significant degradation to the existing water quality will be allowed. In accordance with current DEQ guidance, no significant lowering of water quality is to occur where permit limits are based on the following:

- The dissolved oxygen in the receiving stream is not lowered more than 0.2 mg/L from the existing levels;
- The pH of the receiving stream is maintained within the range 6.0-9.0 S.U.;
- There is compliance with all temperature criteria applicable to the receiving stream;
- No more than 25% of the unused assimilative capacity is allocated for toxic criteria established for the protection of aquatic life; and
- No more than 10% of the unused assimilative capacity is allocated for criteria for the protection of human health.

The antidegradation policy also prohibits the expansion of mixing zones to Tier 2 waters unless the requirements of 9VAC25-260-30.A.2 are met. The draft permit is not proposing an expansion of the existing mixing zone.

17. Effluent Screening, Wasteload Allocation, and Effluent Limitation Development :

To determine water quality-based effluent limitations for a discharge, the suitability of data must first be determined. Data is suitable for analysis if one or more representative data points is equal to or above the quantification level ("QL") and the data represent the exact pollutant being evaluated.

Next, the appropriate Water Quality Standards are determined for the pollutants in the effluent. Then, the Wasteload Allocations (WLA) are calculated. The WLA values are then compared with available effluent data to determine the need for effluent limitations. Effluent limitations are needed if the 97th percentile of the daily effluent concentration values is greater than the acute wasteload allocation or if the 97th percentile of the four-day average effluent concentration values is greater than the chronic wasteload allocation. Effluent limitations are the calculated on the most limiting WLA, the required sampling frequency, and statistical characteristics of the effluent data.

a) Effluent Screening:
Effluent data obtained from the permit application and DMRs have been reviewed and determined to be suitable for evaluation. Effluent data were reviewed, and there have been no exceedances of the established limitations. The following pollutants require a wasteload allocation analysis: Total Residual Chlorine, Ammonia as Nitrogen, Lead, Mercury, Nickel, Chloroform, Copper, and Zinc.

b) Mixing Zones and Wasteload Allocations (WLAs):
Wasteload allocations (WLAs) are calculated for those parameters in the effluent with the reasonable potential to cause an exceedance of water quality criteria. The basic calculation for establishing a WLA is the steady state complete mix equation:

$$WLA = \frac{C_o [Q_e + (f) (Q_s)] - [(C_s) (f) (Q_s)]}{Q_e}$$

Where:
- WLA = Wasteload allocation
- C_o = In-stream water quality criteria
- Q_e = Design flow
- f = Decimal fraction of critical flow from mixing evaluation
- Q_s = Critical receiving stream flow (1Q10 for acute aquatic life criteria; 7Q10 for chronic aquatic life criteria; 30Q10 for ammonia criteria; harmonic mean for carcinogen-human health criteria; and 30Q5 for non-carcinogen human health criteria)
- C_s = Mean background concentration of parameter in the receiving stream.

The Water Quality Standards contain two distinct mixing zone requirements. The first requirement is general in nature and requires the "use of mixing zone concepts in evaluating permit limits for acute and chronic standards in 9VAC25-260-140.B". The second requirement is specific and establishes special restrictions for regulatory mixing zones "established by the Board".

The Department of Environmental Quality uses a simplified mixing model to estimate the amount of mixing of a discharge with the receiving stream within specified acute and chronic exposure periods. The simplified model contains the following assumptions and approximations:

- The effluent enters the stream from the bank, either via a pipe, channel or ditch.
- The effluent velocity isn't significantly greater (no more than 1 - 2 ft/sec greater) than the stream velocity.
- The receiving stream is much wider than its depth (width at least ten times the depth).
- Diffusive mixing in the longitudinal direction (lengthwise) is insignificant compared with advective transport (flow).
- Complete vertical mixing occurs instantaneously at the discharge point. This is assumed since the stream depth is much smaller than the stream width.
- Lateral mixing (across the width) is a linear function of distance downstream.

- The effluent is neutrally buoyant (e.g. the effluent discharge temperature and salinity are not significantly different from the stream's ambient temperature and salinity).
- Complete mix is determined as the point downstream where the variation in concentration is 20% or less across the width and depth of the stream.
- The velocity of passing and drifting organisms is assumed equal to the stream velocity.

If it is suitably demonstrated that a reasonable potential for lethality or chronic impacts within the physical mixing area doesn't exist, then the basic complete mix equation, with 100% of the applicable stream flow, is appropriate. If the mixing analysis determines there is a potential for lethality or chronic impacts within the physical mixing area, then the proportion of stream flow that has mixed with the effluent over the allowed exposure time is used in the basic complete mix equation. As such, the wasteload allocation equation is modified to account for the decimal fraction of critical flow (f).

Staff derived wasteload allocations where parameters are reasonably expected to be present in an effluent (e.g., total residual chlorine where chlorine is used as a means of disinfection) and where effluent data indicate the pollutant is present in the discharge above quantifiable levels. With regard to the Outfall 001 discharge, ammonia as N is likely present since this is a WWTP treating sewage, total residual chlorine may be present since chlorine is used for disinfection, and monitoring done as part of the application indicates that lead, nickel, mercury, chloroform, copper, and zinc are present in the discharge. As such, Attachment 5 details the mixing analysis results and WLA derivations for these pollutants.

Antidegradation Wasteload Allocations (AWLAs).

Since the receiving stream has been determined to be a Tier II water, staff must also determine antidegradation wasteload allocations (AWLAs). The steady state complete mix equation is used substituting the antidegradation baseline (C_b) for the in-stream water quality criteria (C_o):

$$AWLA = \frac{C_b (Q_e + Q_s) - (C_s) (Q_s)}{Q_e}$$

Where:
- AWLA = Antidegradation-based wasteload allocation
- C_b = In-stream antidegradation baseline concentration
- Q_e = Design flow
- Q_s = Critical receiving stream flow (1Q10 for acute aquatic life criteria; 7Q10 for chronic aquatic life criteria; 30Q10 for chronic ammonia criteria; harmonic mean for carcinogen-human health criteria; and 30Q5 for non-carcinogen human health criteria)
- C_s = Mean background concentration of parameter in the receiving stream.

Calculated AWLAs for the pollutants noted in b. above are presented in Attachment 5.

c) Effluent Limitations Toxic Pollutants, Outfall 001 –

9VAC25-31-220.D. requires limits be imposed where a discharge has a reasonable potential to cause or contribute to an in-stream excursion of water quality criteria. Those parameters with WLAs and AWLAs that are near effluent concentrations are evaluated for limits.

The VPDES Permit Regulation at 9VAC25-31-230.D. requires that monthly and weekly average limitations be imposed for continuous discharges from POTWs and monthly average and daily maximum limitations be imposed for all other continuous non-POTW discharges.

1) Ammonia as N/TKN:

In the previous permits, Wilderness WWTP used the DO (Monte Carlo) Model (Attachment 7) to establish the limits for Total Kjeldahl Nitrogen (TKN). All the TKN values were then substituted for the ammonia as nitrogen limits. This was done to protect the dissolved oxygen standard in the

receiving stream and prevent violation of the Antidegradation Policy.

The effluent limitations for Ammonia as Nitrogen for each of the design flows are presented in Table 4. They were determined based on the current WLAs and AWLAs; the STATS limit evaluation printouts are found in Attachment 6.

Table 4- Ammonia as Nitrogen Effluent Limitations

Design Flow	Tier	Weekly Average (mg/L)	Monthly Average (mg/L)
0.715 MGD	June- November	NL	NL
	December- May	NL	NL
2.0 MGD	June – November	6.5	8.3
	December - May	NL	NL

For the reissuance of the 2006 permit, staff used the DEQ Regional DO Model (Attachment 7) to establish the TKN limits for the 2.0 MGD flow tier since the last Monte Carlo run did not include this flow tier. Table 5 presents the TKN limitations determined from the modeling.

Table 5. TKN Effluent Limitations

Design Flow	Tier	Monthly Average (mg/L)	Weekly Average (mg/L)
0.715 MGD	June- November	3.0	4.5
	December- May	7.0	10.5
2.0 MGD	June- November	3.0	4.5
	December- May	7.0	10.5

Staff uses the assumption that TKN is equal to twice (2 times) the ammonia value. The Total Kjeldahl Nitrogen (TKN) analysis measures both organic nitrogen and ammonia nitrogen. A TKN limit of 3.0 mg/L assumes that the remaining nitrogen is in the form of refractory organic compounds that will not be easily oxidized and that ammonia is removed when the 3.0 mg/L TKN limit is met. Since the TKN limitations are more stringent than the calculated ammonia limits, final ammonia limits are not required.

The last run of the Monte Carlo model was run after the downstream discharge, Lake of the Woods, was taken offline. The results of the model indicated that, *"The limits at 0.715 MGD discharge tier could be substantially more lenient than those proposed in the previous permit (cBOD5 limit of 20 mg/L and TKN limit of 5 mg/L). However, it is assumed that the current discharge permit limits govern if they are more stringent than the newly modeled ones."* Therefore, based on the model projections, and because of backsliding, the existing concentration limits will remain in effect.

2) Total Residual Chlorine:

Chlorine is used for disinfection so there is reasonable potential for it to be in the final effluent. Staff calculated WLAs for TRC using the flow frequency data in Attachment 1; the WLAs are found in Attachment 6 for each of the flow tiers. Due to the changes in the flow data, the TRC limitations for the 0.715 and 1.25 MGD flow tiers are slightly different than the current permit. The limit derivations for both flow tiers are found in Attachment 6.

3) Metals/Organics:

Effluent monitoring in prior permit cycles found that both copper and zinc limitations were necessary. Staff used the current WLAs for the 0.715 MGD flow tier and found that copper and zinc limits are no longer necessary based on data obtained from the January 2008 through December 2010 DMRs and monitoring done as part of the reissuance application; see Section 18 of the Fact Sheet for an explanation of the backsliding. The limit derivations are found in Attachment 6.

The WLAs and AWLAs for the 2.0 MGD tier were derived using the Total Hardness values (Attachment 10) for effluent produced from the new facility that just began operation. Limit evaluations were done with the same data set as was used for the limit evaluation for the 0.715 MGD tier. The data obtained from the January 2008 through December 2010 DMRs and monitoring done as part of the reissuance application to determine the limits. Limit derivations are also found in Attachment 6. The Total Recoverable Copper limitation changed from 5.7 ug/L to No Limit Necessary. The Total Recoverable Zinc limitation changed from 56 ug/L to 65 ug/L. Since the new facility has not been online for very long, staff shall require 1/6 month monitoring for Dissolved Copper and Total Hardness at the 2.0 MGD flow tier during the next permit term. The data collected will be evaluated during the next reissuance to insure that the assumptions made during this reissuance are correct.

Quantifiable values for Nickel, Lead, and Mercury were noted in the effluent during monitoring done as part of the reissuance. The values were well below the established WLAs and AWLAs that it is staff's best professional judgment that there is no reasonable potential to exceed the established water quality criteria and no limits are necessary and no further monitoring is warranted.

A quantifiable value, 6 ug/L, for Chloroform was noted in the effluent during monitoring done as part of the application for the reissuance. This value is well below the Human Health criterion of 21,000 ug/L. It is staff's best professional judgment that there is no reasonable potential to exceed the established water quality criteria and no limits are necessary and no further monitoring is warranted.

d) Effluent Limitations and Monitoring, Outfall 001 – Conventional and Non-Conventional Pollutants

No changes to dissolved oxygen (D.O.), carbonaceous biochemical oxygen demand-5 day ($CBOD_5$), total suspended solids (TSS), Total Kjeldahl Nitrogen (TKN), and pH limitations are proposed at the 0.715 MGD flow. Dissolved Oxygen, $cBOD_5$, and TKN limitations for the 0.715 MGD flow tier are based on the stream modeling conducted by Clifford & Associates in July 2000 (Attachment 7) and are set to meet the antidegradation requirements and water quality criteria for D.O. in the receiving stream.

The 1.25 MGD flow tier was removed with this reissuance since the facility is under construction at a 2.0 MGD design flow. The modeling work for this flow tier was left in Attachment 7 for historical reference.

The DEQ Regional Dissolved Oxygen Model was run for the 2.0 MGD flow tier. The model used is a steady state stream D.O. model based on the belief that the discharge is continuous in nature. Staff used the same stream characteristics that were used in the original modeling, but increased the discharge flow and the water treatment plant withdrawal rate. The model showed that the dissolved oxygen dropped more than 0.2 mg/L and antidegradation would be violated if the $cBOD_5$ was left at 14 mg/L in the summer. Staff changed the $cBOD_5$ from 14 mg/L to 8 mg/L to assure antidegradation is protected in the summer months. The model runs for the 2.0 MGD are found in Attachment 7.

It is staff's practice to equate the Total Suspended Solids limits with the $CBOD_5$ limits. TSS limits are established to equal BOD_5 limits since the two pollutants are closely related in terms of treatment of domestic sewage.

pH limitations are set at the water quality criteria.

E. coli limitations are in accordance with the Water Quality Standards 9VAC25-260-170.

e) Effluent Annual Average Limitations and Monitoring, Outfall 001 – Nutrients

VPDES Regulation 9VAC25-31-220(D) requires effluent limitations that are protective of both the numerical and narrative water quality standards for state waters, including the Chesapeake Bay.

As discussed in Section 15, significant portions of the Chesapeake Bay and its tributaries are listed as impaired with nutrient enrichment cited as one of the primary causes. Virginia has committed to protecting and restoring the Bay and its tributaries. Only concentration limits are now found in the individual VPDES

permit when the facility installs nutrient removal technology. The basis for the concentration limits is 9VAC25-40 - *Regulation for Nutrient Enriched Waters and Dischargers within the Chesapeake Bay Watershed* which requires new or expanding discharges with design flows of ≥0.04 MGD to treat for TN and TP to either BNR levels (TN = 8 mg/L; TP = 1.0 mg/L) or SOA levels (TN = 3.0 mg/L and TP = 0.3 mg/L). DEQ Guidance Memorandum GM07-2008 also provides guidance for implementing the annual average nutrient limitations in the individual permits.

This facility has also obtained coverage under 9VAC25-820 *General Virginia Pollutant Discharge Elimination System (VPDES) Watershed Permit Regulation for Total Nitrogen and Total Phosphorus Discharges and Nutrient Trading in the Chesapeake Bay Watershed in Virginia.* This regulation specifies and controls the nitrogen and phosphorus loadings from facilities and specifies facilities that must register under the general permit. Nutrient loadings for those facilities registered under the general permit as well as compliance schedules and other permit requirements, shall be authorized, monitored, limited, and otherwise regulated under the general permit and not this individual permit. This facility has coverage under this General Permit; the permit number is VAN020029. Total Nitrogen Annual Loads and Total Phosphorus Annual Loads from this facility are found in 9VAC25-720 – *Water Quality Management Plan Regulation* which sets forth TN and TP maximum wasteload allocations for facilities designated as significant discharges, i.e., those with design flows of ≥0.5 MGD above the fall line and ≥0.1 MGD below the fall line.

This facility has wasteload allocations of 15,228 lb/year Total Nitrogen and 1,142 lb/year Total Phosphorus which were derived using a design flow of 1.25 MGD and concentrations of 4.0 mg/L for Total Nitrogen and 0.30 mg/L Total Phosphorus. At 2.0 MGD, they will have to treat to 2.5 mg/L TN and 0.19 mg/L TP. They have provided an offset plan indicating that SOA treatment will allow them to self offset up to a flow of 1.67 MGD. The permittee has provided flow projections indicating that they will only be up to 0.93 MGD in 2018. In the long term, the offset plan calls for them to find WLA from another discharger within the Rappahannock River Basin.

Monitoring for Nitrates + Nitrites, Total Kjeldahl Nitrogen, Total Nitrogen, and Total Phosphorus are included in this permit. The monitoring is needed to protect the Water Quality Standards of the Chesapeake Bay. Monitoring frequencies are set at the frequencies set forth in 9VAC25-820. Annual average effluent limitations, as well as monthly and year to date calculations, for Total Nitrogen and Total Phosphorus are included in this individual permit. The annual averages are based on the technology installed as part of the WQIF grant funding.

f) Effluent Limitations and Monitoring Summary.

The effluent limitations are presented in the following table. Limits were established for Flow, $CBOD_5$, Total Suspended Solids, Total Kjeldahl Nitrogen (TKN), pH, Dissolved Oxygen, Total Residual Chlorine, Annual Average Total Nitrogen, Annual Average Total Phosphorus, *E. coli,* Total Recoverable Copper, and Total Recoverable Zinc.

The limit for Total Suspended Solids is based on Best Professional Judgement.

The mass loading (kg/d) for monthly and weekly averages were calculated by multiplying the concentration values (mg/l), with the flow values (in MGD) and a conversion factor of 3.785.

Sample Type and Frequency are in accordance with the recommendations in the VPDES Permit Manual.

The VPDES Permit Regulation at 9VAC25-31-30 and 40 CFR Part 133 require that the facility achieve at least 85% removal for CBOD and TSS (or 65% for equivalent to secondary). The limits in this permit are water-quality-based effluent limits and result in greater than 85% removal.

18. Antibacksliding:

The backsliding proposed with this reissuance conforms to the anti-backsliding provisions of Section 402(o) of the Clean Water Act, 9 VAC 25-31-220.L., and 40 § CFR 122.44. The zinc and copper limits at the 0.715 and the 2.0 MGD flow tiers are water quality based effluent limits. Also, the coefficient of variation used to derive the limits is better because there is new data that was produced during the current permit term. The revisions to the limits are

allowed since the revisions comply with the water quality standards 402(o)(3) and they are consistent with antidegradation 303(d)(4)(B).

19.a. Effluent Limitations/Monitoring Requirements:

Design flow is 0.715 MGD.

Effective Dates: During the period beginning with the permit's effective date and lasting until the CTO for the 2.0 MGD tier or the expiration date, whichever comes first.

PARAMETER	BASIS FOR LIMITS	DISCHARGE LIMITATIONS				MONITORING REQUIREMENTS	
		Monthly Average	Weekly Average	Minimum	Maximum	Frequency	Sample Type
Flow (MGD)	NA	NL	NA	NA	NL	Continuous	TIRE
pH	3	NA	NA	6.0 S.U.	9.0 S.U.	1/D	Grab
cBOD (Jun-Nov)	5	14 mg/L 38 kg/day	21 mg/L 57 kg/day	NA	NA	3D/W	8H-C
cBOD (Dec-May)	5	24 mg/L 65 kg/day	36 mg/L 97 kg/day	NA	NA	3D/W	8H-C
TSS (Jun-Nov)	2	14 mg/L 38 kg/day	21 mg/L 57 kg/day	NA	NA	3D/W	8H-C
TSS (Dec-May)	2	24 mg/L 65 kg/day	36 mg/L 97 kg/day	NA	NA	3D/W	8H-C
TKN (Jun-Nov)	5	3.0 mg/L 8.1 kg/day	4.5 mg/L 12 kg/day	NA	NA	3D/W	8H-C
TKN (Dec-May)	5	7.0 mg/L 19 kg/day	10 mg/L 28 kg/day	NA	NA	3D/W	8H-C
Dissolved Oxygen	3	NA	NA	6.5 mg/L	NA	1/D	Grab
E. coli (Geometric Mean)	3	126 n/100mls	NA	NA	NA	1/W	Grab
Total Residual Chlorine (after contact tank)	2, 3, 4	NA	NA	1.0 mg/L	NA	3/D at 4-hr Intervals	Grab
Total Residual Chlorine (after dechlorination)	3	0.010 mg/L	0.011 mg/L	NA	NA	3/D at 4-hr Intervals	Grab

The basis for the limitations codes are:

1. Federal Effluent Requirements
2. Best Professional Judgment
3. Water Quality Standards
4. DEQ Disinfection Guidance
5. Stream Model- Attachment 7

MGD = Million gallons per day.
NA = Not applicable.
NL = No limit; monitor and report.
S.U. = Standard units.
TIRE = Totalizing, indicating and recording equipment.

1/D = Once every day.
1/W = Once every week.
3D/W = Three days a week.
3/D = Three samples per day at four hour intervals.

8H-C = A flow proportional composite sample collected manually or automatically, and discretely or continuously, for the entire discharge of the Monitored 8-hour period. Where discrete sampling is employed, the permittee shall collect a minimum of eight (8) aliquots for compositing. Discrete sampling may be flow proportioned either by varying the time interval between each aliquot or the volume of each aliquot. Time composite samples consisting of a minimum eight (8) grab samples obtained at hourly or smaller intervals may be collected where the permittee demonstrates that the discharge flow rate (gallons per minute) does not vary by ≥10% or more during the monitored discharge.

Grab = An individual sample collected over a period of time not to exceed 15-minutes.

19.b. Effluent Limitations/Monitoring Requirements:

Design flow is 2.0 MGD.

Effective Dates: During the period beginning with the CTO for the 2.0 MGD tier and lasting until the expiration date.

PARAMETER	BASIS FOR LIMITS	DISCHARGE LIMITATIONS				MONITORING REQUIREMENTS	
		Monthly Average	Weekly Average	Minimum	Maximum	Frequency	Sample Type
Flow (MGD)	NA	NL	NA	NA	NL	Continuous	TIRE
pH	3	NA	NA	6.0 S.U.	9.0 S.U.	1/D	Grab
cBOD (Jun-Nov)[c]	5	8 mg/L 61 kg/day	12 mg/L 91 kg/day	NA	NA	5D/W	24H-C
cBOD (Dec-May)[c]	5	20 mg/L 150 kg/day	30 mg/L 230 kg/day	NA	NA	5D/W	24H-C
TSS (Jun-Nov)[c]	2	8 mg/L 61 kg/day	12 mg/L 91 kg/day	NA	NA	5D/W	24H-C
TSS (Dec-May)[c]	2	20 mg/L 150 kg/day	30 mg/L 230 kg/day	NA	NA	5D/W	24H-C
TKN (Jun-Nov)[c]	5	3.0 mg/L 23 kg/day	4.5 mg/L 34 kg/day	NA	NA	5D/W	24H-C
TKN (Dec-May)[c]	5	7.0 mg/L 53 kg/day	10 mg/L 76 kg/day	NA	NA	5D/W	24H-C
Dissolved Oxygen	3	NA	NA	6.5 mg/L	NA	1/D	Grab
E. coli (Geometric Mean)	3	126 n/100mls	NA	NA	NA	1/W	Grab
Total Residual Chlorine (after contact tank)	2, 3, 4	NA	NA	1.0 mg/L	NA	4/D at 4-hr Intervals	Grab
Total Residual Chlorine (after dechlorination)	3	0.009 mg/L	0.010 mg/L	NA	NA	4/D at 4-hr Intervals	Grab
Nitrate+Nitrite, as N	3, 6	NL mg/L	NA	NA	NA	1/W	24H-C
Total Nitrogen [a.]	3, 6	NL mg/L	NA	NA	NA	1/W	Calculated
Total Nitrogen – Year to Date [b.]	3, 6	NL mg/L	NA	NA	NA	1/M	Calculated
Total Nitrogen - Calendar Year [b.]	3, 6	3.0 mg/L	NA	NA	NA	1/YR	Calculated
Total Phosphorus	3	NL mg/L	NA	NA	NA	1/W	24H-C
Total Phosphorus – Year to Date [b.]	3, 6	NL mg/L	NA	NA	NA	1/M	Calculated
Total Phosphorus - Calendar Year [b.]	3, 6	0.30 mg/L	NA	NA	NA	1/YR	Calculated
Total Hardness	2, 3	NL mg/L $CaCO_3$	NL mg/L $CaCO_3$	NA	NA	1/6M	Grab
Total Recoverable Copper	2, 3	NL ug/L	NL ug/L	NA	NA	1/6M	Grab
Total Recoverable Zinc	3	65 ug/L	65 ug/L	NA	NA	1/3M	Grab
Chronic Toxicity – *C. dubia* (TU_c)		NA	NA	NA	NL	1/3M	24H-C
Chronic Toxicity – *P. promelas* (TU_c)		NA	NA	NA	NL	1/3M	24H-C

The basis for the limitations codes are:

1. Federal Effluent Requirements
2. Best Professional Judgment
3. Water Quality Standards
4. DEQ Disinfection Guidance
5. Stream Model- Attachment 7
6. 9VAC25-40 (Nutrient Regulation)

MGD = Million gallons per day.
NA = Not applicable.
NL = No limit; monitor and report.
S.U. = Standard units.
TIRE = Totalizing, indicating and recording equipment.

1/D = Once every day.
1/M = Once every month.
5D/W = Five days a week.
1/W = Once every weeks.
1/3M = Once every three months.
1/6M = Once every six months.
1/YR = Once every year.
4/D = Four samples per day at four hour intervals.

24H-C = A flow proportional composite sample collected manually or automatically, and discretely or continuously, for the entire discharge of the Monitored 24-hour period. Where discrete sampling is employed, the permittee shall collect a minimum of twenty-four (24) aliquots for compositing. Discrete sampling may be flow proportioned either by varying the time interval between each aliquot or the volume of each aliquot. Time composite samples consisting of a minimum twenty-four (24) grab samples obtained at hourly or smaller intervals may be collected where the permittee demonstrates that the discharge flow rate (gallons per minute) does not vary by ≥10% or more during the monitored discharge.

Grab = An individual sample collected over a period of time not to exceed 15-minutes.

a. Total Nitrogen = Sum of TKN plus Nitrate+Nitrite

b. See Section 20.a. for the calculation of the Nutrient Calculations.

c. See Section 21.m for the Reduced Monitoring Special Condition for cBOD, TSS, and TKN.

20. Other Permit Requirements:

a) Part I.B. of the permit contains additional chlorine monitoring requirements, quantification levels and compliance reporting instructions.
These additional chlorine requirements are necessary per the Sewage Collection and Treatment Regulations at 9VAC25-70 and by the Water Quality Standards at 9VAC25-260-170. A minimum chlorine residual must be maintained at the exit of the chlorine contact tank to assure adequate disinfection. No more that 10% of the monthly test results for TRC at the exit of the chlorine contact tank shall be <1.0 mg/L with any TRC <0.6 mg/L considered a system failure. Monitoring at numerous STPs has concluded that a TRC residual of 1.0 mg/L is an adequate indicator of compliance with the *E. coli* criteria. *E. coli* limits are defined in this section as well as monitoring requirements to take effect should an alternate means of disinfection be used.

9VAC25-31-190.L.4.c. requires an arithmetic mean for measurement averaging and 9VAC25-31-220.D. requires limits be imposed where a discharge has a reasonable potential to cause or contribute to an in-stream excursion of water quality criteria. Specific analytical methodologies for toxics are listed in this permit section as well as quantification levels (QLs) necessary to demonstrate compliance with applicable permit limitations or for use in future evaluations to determine if the pollutant has reasonable potential to cause or contribute to a violation. Required averaging methodologies are also specified.

The calculations for the Nitrogen and Phosphorus parameters shall be in accordance with the calculations set forth in 9VAC25-820 *General Virginia Pollutant Discharge Elimination System (VPDES) Watershed Permit Regulation for Total Nitrogen and Total Phosphorus Discharges and Nutrient Trading in the Chesapeake Bay Watershed in Virginia.* §62.1-44.19:13 of the Code of Virginia defines how annual nutrient loads are to be calculated; this is carried forward in 9VAC25-820-70. As annual concentrations (as opposed to loads) are limited in the individual permit, these reporting calculations are intended to reconcile the reporting calculations between the permit programs, as the permittee is collecting a single set of samples for the purpose of ascertaining compliance with two permits.

b) Permit Section Part I.C., details the requirements for Toxics Management Program.

The VPDES Permit Regulation at 9VAC25-31-210 requires monitoring and 9VAC25-31-220.I, requires limitations in the permit to provide for and assure compliance with all applicable requirements of the State Water Control Law and the Clean Water Act. A TMP is imposed for municipal facilities with a design rate >1.0 MGD, with an approved pretreatment program or required to develop a pretreatment program, or those determined by the Board based on effluent variability, compliance history, IWC, and receiving stream characteristics.

The facility is currently undergoing an expansion to a design flow of 2.0 MGD. The effluent shall be monitored for eight quarters once the expansion is complete. Once all quarterly monitoring is complete and if all the samples pass the decision criteria, the facility will be eligible for a reduction in the monitoring to annual.

c) Permit Section Part I.D., details the requirements of a Pretreatment Program.
The VPDES Permit Regulation at 9VAC25-31-210 requires monitoring and 9VAC25-31-220.D requires all discharges to protect water quality. The VPDES Permit Regulation at 9VAC25-31-730 through 900., and 40 CFR Part 403 requires POTWs with a design flow of >5 MGD and receiving from Industrial Users (IUs) pollutants which pass through or interfere with the operation of the POTW or are otherwise subject to pretreatment standards to develop a pretreatment program.

Wilderness is a POTW with a design capacity of 0.715 MGD; the facility is also undergoing expansion for a final design flow of 2.0 MGD. Rapidan Service Authority (RSA) also operates the following POTW's: Town of Gordonsville STP (VA0021105), 0.97 MGD and Town of Madison STP (VA0022845), 0.08 MGD. RSA already implements an approved Pretreatment program for the Wilderness STP. Pretreatment program conditions for this permit reissuance are included in Part I.D of the VPDES permit. Currently there are no significant industrial users discharging to the Wilderness WWTP or any of the other RSA facilities.

Program requirements and reporting are found in this section of the permit.

d) Permit Section Part I.E. details requirements of the Sewage Sludge Management Plan, Sludge Monitoring and Additional Reporting Requirements.

1. Regulations:

The VPDES Permit Regulation (9VAC25-31-10 et seq.), has incorporated technical standards for the use or disposal of sewage sludge, specifically land application and surface disposal, promulgated under 40 CFR Part 503.

The Permit Regulation (9VAC25-31-420) also establishes the standards for the use or disposal of sewage sludge. This part establishes standards that consist of general requirements, pollutant limits, management practices, and operational standards for the final use or disposal of sewage sludge generated during the treatment of domestic sewage in the treatment works.

2. Evaluations:

Sludge Classification:

The Wilderness WWTP is considered as Class I sludge management facility. The permit regulation (9VAC25-31-500) defines a Class I sludge management facility as any POTW which is required to have an approved pretreatment program defined under Part VII of the VPDES Permit Regulation (9VAC25-31-730 to 900) and/or any treatment works treating domestic sewage sludge that has been classified as a Class I facility by the Board because of the potential for its sewage sludge use or disposal practice to adversely affect public health and the environment.

Sludge Pollutant Concentration:

The average pollutant concentrations from sewage sludge analyses provided as part of the Wilderness WWTP application for the permit reissuance are presented in Table 6.

Table 6 – Wilderness STP Results

Pollutant	Average Concentration (mg/kg dry weight)	Sample Type
Arsenic	2.5	Composite
Cadmium	0.68	Composite
Copper	123	Composite
Lead	9.2	Composite
Mercury	<0.85	Composite
Molybdenum	2.1	Composite
Nickel	9.0	Composite
Selenium	2.9	Composite
Zinc	323	Composite

All sewage sludge applied to the land must meet the ceiling concentration for pollutants, listed in Table 7. Sewage sludge applied to the land must also meet either pollutant concentration limits, cumulative pollutant loading rate limits, or annual pollutant loading rate limits, also listed in Table 7.

Cumulative pollutant loading limits or annual pollutant loading limits may be applied to sewage sludge exceeding pollutant concentration limits but meeting the ceiling concentrations, depending upon the levels of treatment achieved and the form (bulk or bag) of sludge applied. It should be noted that ceiling concentration limits are instantaneous values and pollutant concentration limits are monthly average values. Calculations of cumulative pollutant loading should be based on the monthly average values and the annual whole sludge application rate.

Table 7- SEWAGE SLUDGE POLLUTANT LIMITS

Pollutant	Ceiling Concentration Limits for All Sewage Sludge Applied to Land (mg/kg)*	Pollutant Concentration Limits for EQ and PC Sewage Sludge (mg/kg)*	Cumulative Pollutant Loading Rate Limits for CPLR Sewage Sludge (kg/hectare)	Annual Pollutant Rate Limits for APLR Sewage Sludge (kg/hectare/356 day period)**
Arsenic	75	41	41	2.0
Cadmium	85	39	39	1.9
Copper	4,300	1,500	1,500	75
Lead	840	300	300	15
Mercury	57	17	17	0.85
Molybdenum	75	---	---	---
Nickel	420	420	420	21
Selenium	100	100	100	5.0
Zinc	7,500	2,800	2,800	140
Applies to:	All sewage sludge that is land applied	Bulk sewage sludge and bagged sewage sludge	Bulk sewage sludge	Bagged sewage
From VPDES Permit Reg. Part VI	Table 1, 9 VAC 25-31-540	Table 3, 9 VAC 25-31-540	Table 2, 9 VAC 25-31-540	Table 4, 9 VAC 25-31-540

*Dry-weight basis
**Bagged sewage sludge is sold or given away in a bag or other container.

Comparing data from Table 6 with Table 7 shows that metal concentrations are significantly below the ceiling and PC concentration requirements.

3. Options for Meeting Land Application:

There are four equally safe options for meeting land application requirements. The options include the Exceptional Quality (EQ) option, the Pollutant Concentration (PC) option, the Cumulative Pollutant Loading Rate (CPLR) option, and the Annual Pollutant Loading Rate (APLR) option.

Pollutant Concentration (PC) is the type of sludge that may only be applied in bulk and is subject to general requirements and management practices; however, tracking of pollutant loadings to the land is not required. The sludge from the Wilderness WWTP is considered Pollutant Concentration (PC) sewage sludge for the following reasons:

a) The bulk sewage sludge from the Wilderness WWTP meets the PC limits in Table 1 of VPDES Permit Regulation Part VI, 9 VAC 25-31-540.

b) The VPDES Permit Regulation, Part VI, Subpart D, (9 VAC 25-31-690 through 720) establishes the requirements for pathogen reduction in sewage sludge. The Wilderness WWTP is considered to produce a Class B sludge in accordance with the regulation (9 VAC 25-31-710.B.2. - Class B -Alternative 2. Alternative 2 defines Class B sludge as "Sewage sludge that is used or disposed that has been treated in a process that is equivalent to a Process to Significantly Reduce Pathogens (PSRP), as described in (9 VAC 25-31-710.D.). The Wilderness WWTP treats sludge using aerobic digestion followed by dewatering with a sludge press to reduce pathogens in accordance with the requirements of (9 VAC 25-31-710.D.1.).

c) The VPDES Permit Regulation, Part VI, Subpart D, (9 VAC 25-31-690 through 720) also establishes the requirements for Vector Attraction Reduction in sewage sludge. Based on the information supplied with the VPDES Sludge Application, the Wilderness WWTP meets the requirements for Vector Attraction Reduction as defined by (9 VAC 25-31-720.B.1): the mass of volatile solids in the sewage sludge is reduced by a minimum of 38 percent, calculated according to the method in 9 VAC 25-31-490.B.8.

4) Parameters to be Monitored:

In order to assure the sludge quality, the following parameters require monitoring: Arsenic, Cadmium, Copper, Lead, Mercury, Molybdenum, Nickel, Selenium, and Zinc.

In order to ensure that proper nutrient management and pH management practices are employed, the following parameters are required: pH, Total Kjeldahl Nitrogen, Ammonia Nitrogen, Nitrate Nitrogen, Total Phosphorus, Total Potassium, and Alkalinity (lime treated sludge should be analyzed for percent calcium carbonate equivalence). The nutrient and pH monitoring requirements apply only if the permittee land applies their own sludge. Since Wilderness WWTP has contracted the land application responsibilities to Recyc Systems Inc., of Remington, Virginia, they are not required to monitor for nutrients, pH, Total Potassium and Alkalinity.

Soil monitoring in conjunction with soil productivity information is critical, especially for frequent applications, to making sound sludge application decisions from both an environmental and an agronomic standpoint. Since Wilderness WWTP has contracted the land application responsibilities to Recyc Systems Inc., of Remington, Virginia, they are not required to perform soil monitoring.

5) Monitoring Frequency:

The monitoring frequency is based on the amount of sewage sludge applied in a given 365-day period. The permit application indicates that the total dry metric tons of sewage sludge generated at Wilderness WWTP are 1185 dry metric tons per 365-day period. In the permit manual, the monitoring frequency for facilities that produce Equal to or greater than 290 metric tons but less than 1500 metric tons per 365-day period is once per quarter. This reissuance proposes a monitoring frequency of 1/quarter.

Wilderness WWTP is required to provide the results of all monitoring performed in accordance with Part I.A., and information on management practices and appropriate certifications no later than February 19th of each year (as required by the 503 regulations) to the Northern Regional Office of the Department of Environmental Quality. Each report must document the previous calendar year's activities.

6) Sampling:

Representative sampling is an important aspect of monitoring. Because the pollutant limits pertain to the quality of the final sewage sludge applied to the land, samples must be collected after the last treatment process prior to land application. Composite samples should be required for all samplings from this facility.

7) Sludge Management Plan (SMP):

The SMP is required to be part of the VPDES permit application. The VPDES Sewage Sludge Permit Application Form and its attachments will constitute the applicant's SMP. Any proposed sewage treatment works treating domestic sewage must submit a SMP with the appropriate VPDES permit application forms at least 180 days prior to the date proposed for commencing operations. The permittee shall conduct all sewage sludge use or disposal activities in accordance with the SMP approved with the issuance of this permit. Any proposed changes in the sewage sludge use or disposal practices or procedures followed by the permittee shall be documented and submitted for Virginia Department of Environmental review and approval no less than 90 days prior to the effective date of the changes.

Upon approval, the SMP becomes an enforceable part of the permit. The permit may be modified or alternatively revoked and reissued to incorporate limitations/conditions necessitated by substantial changes in sewage sludge use or disposal practices.

Wilderness WWTP has submitted the VPDES Sewage Sludge Permit Application Form and its attachments. Their SMP dated December 30, 2010 is on file at the Northern Regional Office of the Department of Environmental Quality.

8) Reporting Requirements:

The reporting requirements are for POTWs with a design flow rate equal to or greater than 1 MGD (majors), POTWs that serve a population of 10,000 or greater, and Class I sludge management facilities. A permit special condition, which requires these generators to submit an annual report on February 19th of each year, is included. The Wilderness WWTP shall use the Discharge Monitoring Report (DMR) forms as part of the annual report. A sample form (SP1 and S01) with proper DMR parameter codes and its instructions are provided. In addition to the DMR forms, the generators who land apply sewage sludge are responsible for submitting the additional information required by 9VAC25-31-590, *i.e.*, appropriate certification statements, descriptions of how pathogen and vector attraction reduction requirements are met, descriptions of how the management practices (if applicable) are being met, and descriptions of how site restrictions (if applicable) are being met.

9) Records Keeping:

This special condition outlines record retention requirements for sludge meeting Class B pathogen reduction and vector attraction reduction alternative 1-10. Table 8 presents the record keeping requirements.

Table 8: Record Keeping for PC Sludge

1	Pollutant concentrations of each pollutant in Part I.A.3 of the permit;
2	Description of how the pathogen reduction requirement in Part I.A.3 of the permit are met;
3	Description of how the vector attraction requirements in Part I.A.3 of the permit are met;
4	Description of how the management practice specified in the approved Sludge Management Plan and/or the permit are met;
5	Description of how the site restriction specified in the Sludge Management Plan and/or the permit are met;
6	Certification statement in Part I.E.3.b.2.f. of the permit.

21. Other Special Conditions:

a) 95% Capacity Reopener. The VPDES Permit Regulation at 9VAC25-31-200.B.4 requires all POTWs and PVOTWs develop and submit a plan of action to DEQ when the monthly average influent flow to their sewage treatment plant reaches 95% or more of the design capacity authorized in the permit for each month of any three consecutive month period. This facility is a POTW.

b) Indirect Dischargers. Required by VPDES Permit Regulation, 9VAC25-31-200 B.1 and B.2 for POTWs and PVOTWs that receive waste from someone other than the owner of the treatment works.

c) O&M Manual Requirement. Required by Code of Virginia §62.1-44.19; Sewage Collection and Treatment Regulations, 9VAC25-790; VPDES Permit Regulation, 9VAC25-31-190.E. Within 90 days of the effective date of this permit, the permittee shall submit for approval an Operation and Maintenance (O&M) Manual or a statement confirming the accuracy and completeness of the current O&M Manual to the Department of Environmental Quality, Northern Regional Office (DEQ-NRO). Future changes to the facility must be addressed by the submittal of a revised O&M Manual within 90 days of the changes. Non-compliance with the O&M Manual shall be deemed a violation of the permit.

d) CTC, CTO Requirement. The Code of Virginia § 62.1-44.19; Sewage Collection and Treatment Regulations, 9VAC25-790 requires that all treatment works treating wastewater obtain a Certificate to Construct prior to commencing construction and to obtain a Certificate to Operate prior to commencing operation of the treatment works.

e) Licensed Operator Requirement. The Code of Virginia at §54.1-2300 et seq. and the VPDES Permit Regulation at 9VAC25-31-200 C, and Rules and Regulations for Waterworks and Wastewater Works Operators (18VAC160-20-10 et seq.) requires licensure of operators. This facility requires a Class II operator while at the 0.715 MGD flow tier. This facility shall require a Class I operator once the CTO is obtained for the 2.0 MGD flow tier. The facility shall notify DEQ-NRO within 90 days of receiving the CTO for the 2.0 MGD tier that they have the proper staffing for the facility.

f) Reliability Class. The Sewage Collection and Treatment Regulations at 9VAC25-790 require sewage treatment works to achieve a certain level of reliability in order to protect water quality and public health consequences in the event of component or system failure. Reliability means a measure of the ability of the treatment works to perform its designated function without failure or interruption of service. The facility is required to meet a reliability Class of I.

g) Water Quality Criteria Reopener. The VPDES Permit Regulation at 9VAC25-31-220 D. requires establishment of effluent limitations to ensure attainment/maintenance of receiving stream water quality criteria. Should effluent monitoring indicate the need for any water quality-based limitations, this permit may be modified or alternatively revoked and reissued to incorporate appropriate limitations.

h) Sludge Reopener. The VPDES Permit Regulation at 9VAC25-31-220.C requires all permits issued to treatment works treating domestic sewage (including sludge-only facilities) include a reopener clause allowing incorporation of any applicable standard for sewage sludge use or disposal promulgated under Section 405(d) of the CWA. The facility includes a sewage treatment works. Since the facility had their sludge land applied by a contractor, this special condition is included in Part I.E of the permit.

i) Sludge Use and Disposal. The VPDES Permit Regulation at 9VAC25-31-100.P; 220.B.2, and 420 through 720, and 40 CFR Part 503 require all treatment works treating domestic sewage to submit information on their sludge use and disposal practices and to meet specified standards for sludge use and disposal. The facility includes a treatment works treating domestic sewage. Since the facility had their sludge land applied by a contractor, this special condition is included in Part I.E of the permit.

j) E3/E4. 9VAC25-40-70 B authorizes DEQ to approve an alternate compliance method to the technology-based effluent concentration limitations as required by subsection A of this section. Such alternate compliance method shall be incorporated into the permit of an Exemplary Environmental Enterprise (E3) facility or an Extraordinary Environmental Enterprise (E4) facility to allow the suspension of applicable technology-based effluent concentration limitations during the period the E3 or E4 facility has a fully implemented environmental management system that includes operation of installed nutrient removal technologies at the treatment efficiency levels for which they were designed.

k) Nutrient Reopener. 9VAC25-40-70 A authorizes DEQ to include technology-based annual concentration limits in the permits of facilities that have installed nutrient control equipment, whether by new construction, expansion or upgrade. 9VAC25-31-390 A authorizes DEQ to modify VPDES permits to promulgate amended water quality standards.

l) Nutrient Offsets. The Virginia General Assembly, in their 2005 session, enacted a new Article 4.02 (Chesapeake Bay Watershed Nutrient Credit Exchange Program) to the Code of Virginia to address nutrient loads to the Bay. Section 62.1-44.19:15 sets forth the requirements for new and expanded dischargers, which are captured by the requirements of the law, including the requirement that non-point load reductions acquired for the purpose of offsetting nutrient discharges be enforced through the individual VPDES permit.

m) Monitoring Frequency. Current agency guidance requires that a facility with a design flow between 1.0- 2.0 MGD collect conventional samples five days a week. The monthly average flows for this facility have averaged 0.703 MGD between Jan 2010 to February 2011. When the facility's monthly average flow reaches 50% of the design flow (1.0 MGD) for 3 consecutive months, the facility shall begin 5 day per week monitoring for $CBOD_5$, TSS, and TKN.

Permit Section Part II. Part II of the permit contains standard conditions that appear in all VPDES Permits. In general, these standard conditions address the responsibilities of the permittee, reporting requirements, testing procedures and records retention.

23. Changes to the Permit from the Previously Issued Permit:

a) Special Conditions:
1) The Nutrient Reporting Calculation Special Condition was removed since the calculations are now included in Part I.B of the permit.
2) The Final Effluent Reuse Special Condition was removed since the facility did not submit the application for the reuse of the effluent as part of the reissuance package.
3) The Schedule of Compliance for the Nutrient Loadings was removed.
4) The Toxicity Monitoring language and the Pretreatment Program requirements have been updated to match current agency guidance.
5) A reduced monitoring special condition was added to allow the facility to monitor cBOD, TSS, and TKN at a reduced frequency until the flows at the 2.0 MGD facility reach 50% of the design flow for three consecutive months.

b) Monitoring and Effluent Limitations:
1) The annual nutrient loadings were removed since they are now covered under 9VAC25-820.
2) The Total Residual Chlorine monthly and weekly averages were made more stringent due to the changes in the wasteload allocations.
3) Total Residual Chlorine monitoring for the final effluent was increased to match the monitoring required at the chlorine contact tank. This is in accordance with current agency guidance.
4) The 1.25 MGD flow tier was removed from this reissuance since the facility is under construction for the 2.0 MGD flow tier.
5) Orthophosphate monitoring was removed from this permit.
6) The Total Recoverable Copper limits were removed from the 0.715 and 2.0 MGD flow tiers in accordance with the Agency's antibacksliding policy.
7) The Total Recoverable Zinc limits were removed from the 0.715 MGD flow tier in accordance with the Agency's antibacksliding policy. The Total Recoverable Zinc limits at the 2.0 MGD flow tier were revised to 65 ug/L from 56 ug/L.

24. Variances/Alternate Limits or Conditions:

The facility requested a monitoring waiver for the reissuance application for 2 of the Form 2A priority pollutant scans. The facility has a pretreatment program but it is inactive at this time. Facilities with pretreatment programs are required to perform three priority pollutant scans as part of the reissuance package. Since the program is inactive with no SIUs and given the fact that the design flow of the facility is 0.715 MGD, DEQ forwarded the request to EPA for concurrence. No response from EPA was received. The facility is currently under expansion to 2.0 MGD and will be expected to perform all three scans as part of the next reissuance package.

25. Public Notice Information:

First Public Notice Date: 7/14/11 Second Public Notice Date: 7/21/11

Public Notice Information is required by 9VAC25-31-280 B. All pertinent information is on file and may be inspected, and copied by contacting the: DEQ Northern Regional Office, 13901 Crown Court, Woodbridge, VA 22193, Telephone No. (703) 583-3834, Alison.Thompson@deq.virginia.gov. See Attachment 8 for a copy of the public notice document.

Persons may comment in writing or by email to the DEQ on the proposed permit action, and may request a public hearing, during the comment period. Comments shall include the name, address, and telephone number of the writer and of all persons represented by the commenter/requester, and shall contain a complete, concise statement of the factual basis for comments. Only those comments received within this period will be considered. The DEQ may decide to hold a public hearing, including another comment period, if public response is significant and there are substantial, disputed issues relevant to the permit. Requests for public hearings shall state 1) the reason why a hearing is requested; 2) a brief, informal statement regarding the nature and extent of the interest of the requester or of those represented by the requester, including how and to what extent such interest would be directly and adversely affected by the permit; and 3) specific references, where possible, to terms and conditions of the permit with suggested revisions. Following the comment period, the Board will make a determination regarding the proposed permit action. This determination will become effective, unless the DEQ grants a public hearing. Due notice of any public hearing will be given. The

public may request an electronic copy of the draft permit and fact sheet or review the draft permit and application at the DEQ Northern Regional Office by appointment.

26. 303 (d) Listed Stream Segments and Total Max. Daily Loads (TMDL):

There are two impairments that begin approximately 2.8 miles downstream of Outfall 001:

The Rapidan River is listed as not supporting the recreation use. Sufficient excursions from the maximum *E. coli* bacteria criterion (14 of 40 samples - 35.0%) were recorded at DEQ's ambient water quality monitoring station (3-RAP006.53) at the Route 610 crossing to assess this stream segment as not supporting of the recreation use goal for the 2010 water quality assessment. The bacteria TMDL for the Rapidan River Basin was completed and approved by EPA on 12/5/07. This facility was given a WLA of 3.48E+12 cfu/year for *E. coli.*

The Rapidan River is also listed as not supporting the fish consumption use. Excursions above the water quality criterion based fish tissue value (TV) of 300 parts per billion (ppb) for mercury (Hg) in fish tissue were recorded in three species of fish (American eel, rock bass, smallmouth bass) collected at monitoring station 3-RAP006.53 during 2006. The mercury TMDL has not yet been prepared and is not due until 2022.

The tidal Rappahannock River, which is located approximately 24 miles downstream of this facility, is listed with a PCB impairment. In support for the PCB TMDL that will be developed for the tidal Rappahannock River by 2016, this facility is a candidate for low-level PCB monitoring, based upon its designation as a major municipal facility. Low-level PCB analysis uses EPA Method 1668B, which is capable of detecting low-level concentrations for all 209 PCB congeners. The Assessment/TMDL Staff has concluded that low-level PCB monitoring is not warranted for this facility, as there are not any stream segments immediately downstream of the facility that are listed with a PCB impairment. Fish tissue monitoring has been conducted on the Rapidan River and there have been no exceedances of the fish tissue criterion for PCBs. Based upon this information, this facility will not be requested to monitor for low-level PCBs.

TMDL Reopener: This special condition is to allow the permit to reopened if necessary to bring it in compliance with any applicable TMDL that may be developed and approved for the receiving stream.

27. Additional Comments:

Previous Board Action(s): Rapidan Service Authority had a Letter of Agreement (LOA) and a Consent Special Order (CSO) with DEQ for overflows to the collection system in the Lake of the Woods subdivision. Sewage from this subdivision is treated at the Wilderness WWTP. The LOA and CSO were cancelled in 2009.

Staff Comments: None.

Public Comment: DEQ coordinated with DCR for this permit reissuance. DCR recommended UV disinfection for this facility because of the historical documentation that showed that the presence of the Green floater, a rare freshwater mussel, downstream from the discharge. The facility has historically used chlorination and dechlorination and the upgrade which is almost complete continues chlorine usage. The facility has an excellent compliance record with meeting the chlorine limitations in the final effluent. DCR's comments have been placed in the reissuance file. The facility provided numerous comments on the draft permit including the Total Phosphorus footnote in Part I A of the permit, the TSS concentration limitations, the Total Hardness of the expanded facility and the subsequently derived metals limits, and the inclusion of the Nutrient Offset Special Condition. All issues were resolved prior to public notice.

EPA Checklist: The checklist can be found in Attachment 9.

January 11, 2011
MEMORANDUM

TO: VPDES Reissuance File VA0083411

FROM: Alison Thompson

SUBJECT: Flow Frequency Determination of VPDES Permit No. VA0083411
Wilderness WWTP

COPIES:

This Flow Frequency determination supersedes the determination done in April 2006 as part of the 2006 permit reissuance. The flow frequency values for the gage stations were updated in mid-2006. As in 2006, staff adjusted the updated stream flows with the maximum withdrawal of 2.0 MGD allowed by VWP Permit 96-0271. The flow frequencies at the outfall location shall be determined using values at the Rapidan River gaging station (#01667500) at Culpeper, Virginia, and adjusting them by proportional drainage areas.

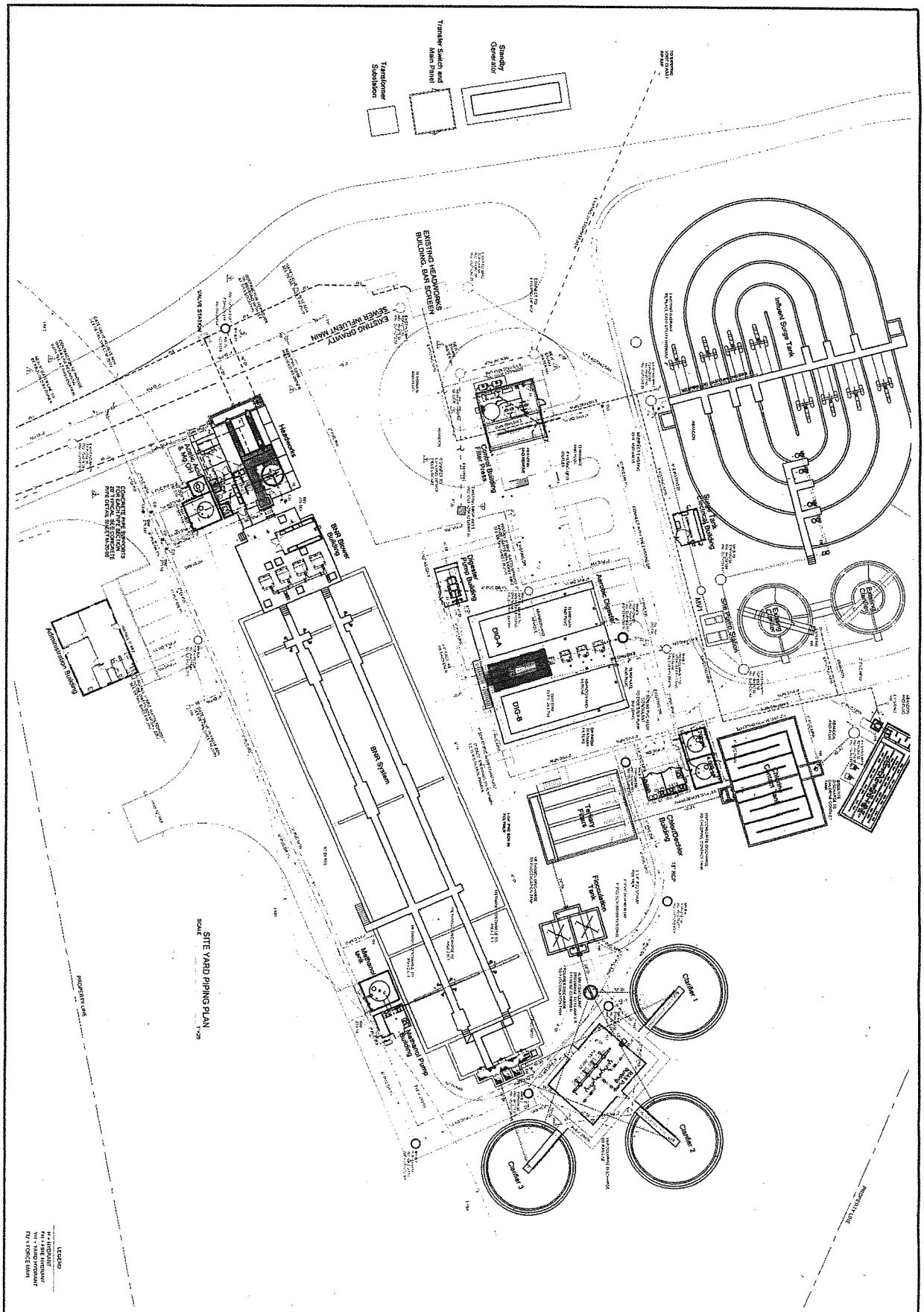
Rapidan River near Culpeper, VA (#01667500)

Drainage area	=	472 sq. mi.
1Q10	=	11 cfs
7Q10	=	16 cfs
30Q5	=	44 cfs
30Q10	=	27 cfs
High flow 30Q10	=	119 cfs
High flow 1Q10	=	66 cfs
High flow 7Q10	=	89 cfs
HM	=	161 cfs

Rapidan River at the discharge point

Drainage area	=	640 sq. mi.	
1Q10	=	14.9 cfs	9.6 – 2.0 = 7.6 MGD
7Q10	=	21.7 cfs	14 – 2.0 = 12 MGD
30Q5	=	59.7 cfs	38.6 – 2.0 = 36.6 MGD
30Q10	=	36.6 cfs	23.7 – 2.0 = 21.7 MGD
High flow 30Q10	=	161.4 cfs	104.3 – 2.0 = 102.3 MGD
High flow 1Q10	=	89.3 cfs	57.7 – 2.0 = 55.7 MGD
High flow 7Q10	=	121 cfs	78 – 2.0 = 76 MGD
HM	=	218 cfs	141 – 2.0 = 139 MGD

The high flow months are December - May



C-02-04

WILDERNESS BIOLOGICAL NUTRIENT REMOVAL
PUBLICLY OWNED TREATMENT WORKS (POTW)
ORANGE COUNTY, VIRGINIA

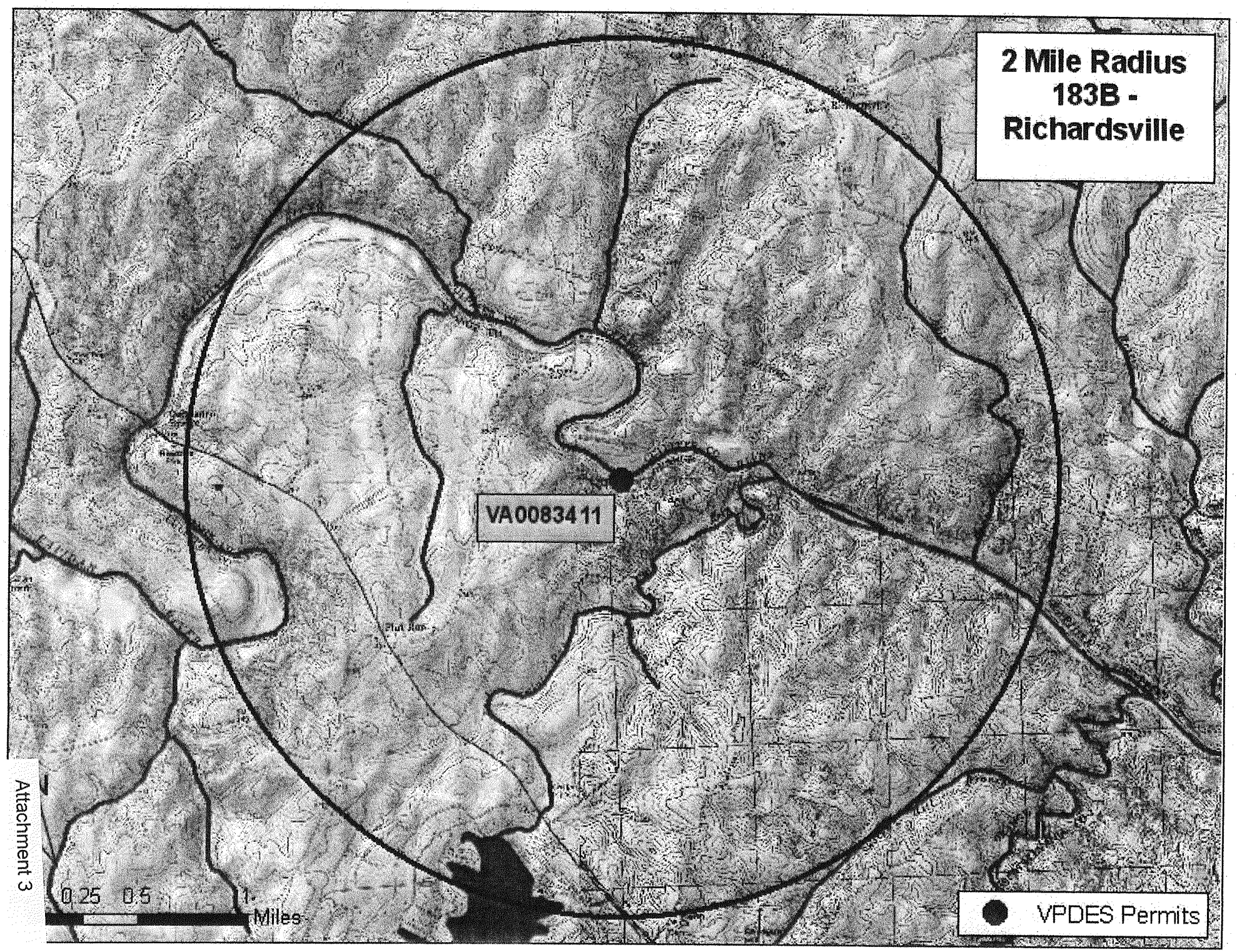
SITE PLAN
SITE YARD PIPING PLAN

NO	REVISIONS	BY	DATE
1	NEW NOTES ADDED	MD	5-25-06
2	CONCRETE PIPES SUPPORT SHOWN IN LIEU OF IN-LINE SHOWN	MD	5-26-06
3	RELOCATED ISH B-11 AND REVISED ASSOCIATED PIPING	GRH	12-7-06

REVISED IN ACCORDANCE WITH CONSTRUCTION RECORDS

Applied Technology and Engineering
545 Panorama Rd. Earlysville, Va 22936
Phone: (434)-978-1422 Fax: (919)-882-9410

Attachment 2



Attachment 3

MEMORANDUM

TO: VA0083411 Reissuance File

FROM: Alison Thompson, NRO

SUBJECT: Site Visit on March 4, 2011 to the Wilderness WWTP
VPDES Permit No. VA0083411

As part of the 2011 reissuance of the VPDES permit for the Wilderness WWTP, staff performed a site visit and stream inspection on March 4, 2011. The Rapidan Service Authority personnel present were Tim Clemons and Joe Compton to provide the tour of the facility.

This WWTP treats the wastewater from the Locust Grove area of Orange County as well as from the Lake of the Woods subdivision located off Route 3. The current design flow of the facility is 0.715 MGD; current flows at the facility average 0.7 MGD for the past 14 months.

The influent to the Wilderness WWTP is screened prior to the influent flow measurement. The wastewater is treated in a quadriplex concentric oxidation ditch operated in extended aeration mode. The oxidation ditch is followed by two secondary clarifiers; polymer is added at the clarifiers to enhance settling. Chlorination of the clarified water is done with gaseous chlorine. Dechlorination is accomplished by sulfur dioxide gas. The effluent flows down a cascade aerator to the Rapidan River.

The facility is in the final stages of construction for expansion to 2.0 MGD. We toured the new portion of the facility where there was concrete work getting completed and the contractor was installing the sand in the new filters. Tim Clemmons estimates that it will be late spring when the construction reaches substantial completion. The upgraded facility will utilize a 5-stage modified Bardenpho process coupled with chemical addition followed by tertiary filtration to achieve state-of-the-art nutrient removal limitations. The facility will continue to utilize chlorination for disinfection.

The effluent was clear and free from floating solids. The outfall is shore-based and there was an approximate 7-10 foot drop from the outfall pipe to the river. Due to natural fluctuations in the stream , most of the rip rap beneath the outfall has washed away. The stream is about 300 feet wide at the discharge location and 3-10 feet in depth. Some minor foam was noted due to the entrained air in the discharge, but the foam quickly dissipated downstream. The river was also observed upstream of the discharge at the water treatment plant intake. The river is of similar width and depth at this upstream point.

FRESHWATER
WATER QUALITY CRITERIA / WASTELOAD ALLOCATION ANALYSIS

Facility Name: Wilderness WWTP 715000 Permit No.: VA0083411

Receiving Stream: Rapidan River Version: OWP Guidance Memo 00-2011 (8/24/00)

Stream Information

Mean Hardness (as CaCO3) =	24.92	mg/L
90% Temperature (Annual) =	19.9	deg C
90% Temperature (Wet season) =	25.5	deg C
90% Maximum pH =	7.9	SU
10% Maximum pH =		SU
Tier Designation (1 or 2) =	2	
Public Water Supply (PWS) Y/N? =	n	
Trout Present Y/N? =	n	
Early Life Stages Present Y/N? =	y	

Stream Flows

1Q10 (Annual) =	7.6	MGD
7Q10 (Annual) =	12	MGD
30Q10 (Annual) =	21.7	MGD
1Q10 (Wet season) =	55.7	MGD
30Q10 (Wet season)	102.3	MGD
30Q5 =	36.6	MGD
Harmonic Mean =	139	MGD

Mixing Information

Annual - 1Q10 Mix =	1.47	%
- 7Q10 Mix =	100	%
- 30Q10 Mix =	100	%
Wet Season - 1Q10 Mix =	8.24	%
- 30Q10 Mix =	100	%

Effluent Information

Mean Hardness (as CaCO3) =	54.7	mg/L
90% Temp (Annual) =	19.9	deg C
90% Temp (Wet season) =	25	deg C
90% Maximum pH =	7.5	SU
10% Maximum pH =		SU
Discharge Flow =	0.715	MGD

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Acenapthene	0	--	--	na	9.9E+02	--	--	na	5.2E+04	--	--	na	9.9E+01	--	--	na	5.2E+03	--	--	na	5.2E+03
Acrolein	0	--	--	na	9.3E+00	--	--	na	4.9E+02	--	--	na	9.3E-01	--	--	na	4.9E+01	--	--	na	4.9E+01
Acrylonitrile[C]	0	--	--	na	2.5E+00	--	--	na	4.9E+02	--	--	na	2.5E-01	--	--	na	4.9E+01	--	--	na	4.9E+01
Aldrin [C]	0	3.0E+00	--	na	5.0E-04	3.5E+00	--	na	9.8E-02	7.5E-01	--	na	5.0E-05	8.7E+00	--	na	9.8E-03	**3.5E+00**	--	na	**9.8E-03**
Ammonia-N (mg/l) (Yearly)	0	1.88E+01	2.03E+00	na	--	2.2E+01	6.4E+01	na	--	2.79E+00	5.08E-01	na	--	3.2E+01	1.6E+01	na	--	**2.2E+01**	**1.6E+01**	na	--
Ammonia-N (mg/l) (High Flow)	0	1.17E+01	1.39E+00	na	--	8.7E+01	2.0E+02	na	--	2.57E+00	3.47E-01	na	--	2.0E+02	5.0E+01	na	--	**8.7E+01**	**5.0E+01**	na	--
Anthracene	0	--	--	na	4.0E+04	--	--	na	2.1E+06	--	--	na	4.0E+03	--	--	na	2.1E+05	--	--	na	**2.1E+05**
Antimony	0	--	--	na	6.4E+02	--	--	na	3.3E+04	--	--	na	6.4E+01	--	--	na	3.3E+03	--	--	na	**3.3E+03**
Arsenic	0	3.4E+02	1.5E+02	na	--	3.9E+02	2.7E+03	na	--	8.5E+01	3.8E+01	na	--	9.9E+02	6.7E+02	na	--	**3.9E+02**	**6.7E+02**	na	--
Barium	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Benzene [C]	0	--	--	na	5.1E+02	--	--	na	1.0E+05	--	--	na	5.1E+01	--	--	na	1.0E+04	--	--	na	**1.0E+04**
Benzidine[C]	0	--	--	na	2.0E-03	--	--	na	3.9E-01	--	--	na	2.0E-04	--	--	na	3.9E-02	--	--	na	**3.9E-02**
Benzo (a) anthracene [C]	0	--	--	na	1.8E-01	--	--	na	3.5E+01	--	--	na	1.8E-02	--	--	na	3.5E+00	--	--	na	**3.5E+00**
Benzo (b) fluoranthene [C]	0	--	--	na	1.8E-01	--	--	na	3.5E+01	--	--	na	1.8E-02	--	--	na	3.5E+00	--	--	na	**3.5E+00**
Benzo (k) fluoranthene [C]	0	--	--	na	1.8E-01	--	--	na	3.5E+01	--	--	na	1.8E-02	--	--	na	3.5E+00	--	--	na	**3.5E+00**
Benzo (a) pyrene [C]	0	--	--	na	1.8E-01	--	--	na	3.5E+01	--	--	na	1.8E-02	--	--	na	3.5E+00	--	--	na	**3.5E+00**
Bis2-Chloroethyl Ether[C]	0	--	--	na	5.3E+00	--	--	na	1.0E+03	--	--	na	5.3E-01	--	--	na	1.0E+02	--	--	na	**1.0E+02**
Bis2-Chloroisopropyl Ether	0	--	--	na	6.5E+04	--	--	na	3.4E+06	--	--	na	6.5E+03	--	--	na	3.4E+05	--	--	na	**3.4E+05**
Bis 2-Ethylhexyl Phthalate [C]	0	--	--	na	2.2E+01	--	--	na	4.3E+03	--	--	na	2.2E+00	--	--	na	4.3E+02	--	--	na	**4.3E+02**
Bromoform [C]	0	--	--	na	1.4E+03	--	--	na	2.7E+05	--	--	na	1.4E+02	--	--	na	2.7E+04	--	--	na	**2.7E+04**
Butylbenzylphthalate	0	--	--	na	1.9E+03	--	--	na	9.9E+04	--	--	na	1.9E+02	--	--	na	9.9E+03	--	--	na	**9.9E+03**
Cadmium	0	1.8E+00	4.0E-01	na	--	2.1E+00	7.1E+00	na	--	2.3E-01	1.0E-01	na	--	2.7E+00	1.8E+00	na	--	**2.1E+00**	**1.8E+00**	na	--
Carbon Tetrachloride [C]	0	--	--	na	1.6E+01	--	--	na	3.1E+03	--	--	na	1.6E+00	--	--	na	3.1E+02	--	--	na	**3.1E+02**
Chlordane [C]	0	2.4E+00	4.3E-03	na	8.1E-03	2.8E+00	7.6E-02	na	1.6E+00	6.0E-01	1.1E-03	na	8.1E-04	7.0E+00	1.9E-02	na	1.6E-01	**2.8E+00**	**1.9E-02**	na	**1.6E-01**
Chloride	0	8.6E+05	2.3E+05	na	--	9.9E+05	4.1E+06	na	--	2.2E+05	5.8E+04	na	--	2.5E+06	1.0E+06	na	--	**9.9E+05**	**1.0E+06**	na	--
TRC	0	1.9E+01	1.1E+01	na	--	2.2E+01	2.0E+02	na	--	4.8E+00	2.8E+00	na	--	5.5E+01	4.9E+01	na	--	**2.2E+01**	**4.9E+01**	na	--
Chlorobenzene	0	--	--	na	1.6E+03	--	--	na	8.4E+04	--	--	na	1.6E+02	--	--	na	8.4E+03	--	--	na	**8.4E+03**

Attachment 5

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
Chlorodibromomethane[C]	0	--	--	na	1.3E+02	--	--	na	2.5E+04	--	--	na	1.3E+01	--	--	na	2.5E+03	--	--	na	2.5E+03
Chloroform	0	--	--	na	1.1E+04	--	--	na	5.7E+05	--	--	na	1.1E+03	--	--	na	5.7E+04	--	--	na	5.7E+04
2-Chloronaphthalene	0	--	--	na	1.6E+03	--	--	na	8.4E+04	--	--	na	1.6E+02	--	--	na	8.4E+03	--	--	na	8.4E+03
2-Chlorophenol	0	--	--	na	1.5E+02	--	--	na	7.8E+03	--	--	na	1.5E+01	--	--	na	7.8E+02	--	--	na	7.8E+02
Chlorpyrifos	0	8.3E-02	4.1E-02	na	--	9.6E-02	7.3E-01	na	--	2.1E-02	1.0E-02	na	--	2.4E-01	1.8E-01	na	--	9.6E-02	1.8E-01	na	--
Chromium III	0	3.3E+02	2.5E+01	na	--	3.8E+02	4.5E+02	na	--	4.9E+01	6.3E+00	na	--	5.8E+02	1.1E+02	na	--	3.8E+02	1.1E+02	na	--
Chromium VI	0	1.6E+01	1.1E+01	na	--	1.9E+01	2.0E+02	na	--	4.0E+00	2.8E+00	na	--	4.7E+01	4.9E+01	na	--	1.9E+01	4.9E+01	na	--
Chromium, Total	0	--	--	1.0E+02	--	--	--	na	--	--	--	1.0E+01	--	--	--	5.2E+02	--	--	--	na	--
Chrysene[C]	0	--	--	na	1.8E-02	--	--	na	3.5E+00	--	--	na	1.8E-03	--	--	na	3.5E-01	--	--	na	3.5E-01
Copper	0	7.1E+00	2.9E+00	na	--	8.2E+00	5.1E+01	na	--	9.9E-01	7.2E-01	na	--	1.2E+01	1.3E+01	na	--	8.2E+00	1.3E+01	na	--
Cyanide, Free	0	2.2E+01	5.2E+00	na	1.6E+04	2.5E+01	9.2E+01	na	8.4E+05	5.5E+00	1.3E+00	na	1.6E+03	6.4E+01	2.3E+01	na	8.4E+04	2.5E+01	2.3E+01	na	8.4E+04
DDD[C]	0	--	--	na	3.1E-03	--	--	na	6.1E-01	--	--	na	3.1E-04	--	--	na	6.1E-02	--	--	na	6.1E-02
DDE[C]	0	--	--	na	2.2E-03	--	--	na	4.3E-01	--	--	na	2.2E-04	--	--	na	4.3E-02	--	--	na	4.3E-02
DDT[C]	0	1.1E+00	1.0E-03	na	2.2E-03	1.3E+00	1.8E-02	na	4.3E-01	2.8E-01	2.5E-04	na	2.2E-04	3.2E+00	4.4E-03	na	4.3E-02	1.3E+00	4.4E-03	na	4.3E-02
Demeton	0	--	1.0E-01	na	--	--	1.8E+00	na	--	--	2.5E-02	na	--	--	4.4E-01	na	--	--	4.4E-01	na	--
Diazinon	0	1.7E-01	1.7E-01	na	--	2.0E-01	3.0E+00	na	--	4.3E-02	4.3E-02	na	--	4.9E-01	7.6E-01	na	--	2.0E-01	7.6E-01	na	--
Dibenz(a,h)anthracene[C]	0	--	--	na	1.8E-01	--	--	na	3.5E+01	--	--	na	1.8E-02	--	--	na	3.5E+00	--	--	na	3.5E+00
1,2-Dichlorobenzene	0	--	--	na	1.3E+03	--	--	na	6.8E+04	--	--	na	1.3E+02	--	--	na	6.8E+03	--	--	na	6.8E+03
1,3-Dichlorobenzene	0	--	--	na	9.6E+02	--	--	na	5.0E+04	--	--	na	9.6E+01	--	--	na	5.0E+03	--	--	na	5.0E+03
1,4-Dichlorobenzene	0	--	--	na	1.9E+02	--	--	na	9.9E+03	--	--	na	1.9E+01	--	--	na	9.9E+02	--	--	na	9.9E+02
3,3-Dichlorobenzidine[C]	0	--	--	na	2.8E-01	--	--	na	5.5E+01	--	--	na	2.8E-02	--	--	na	5.5E+00	--	--	na	5.5E+00
Dichlorobromomethane[C]	0	--	--	na	1.7E+02	--	--	na	3.3E+04	--	--	na	1.7E+01	--	--	na	3.3E+03	--	--	na	3.3E+03
1,2-Dichloroethane[C]	0	--	--	na	3.7E+02	--	--	na	7.2E+04	--	--	na	3.7E+01	--	--	na	7.2E+03	--	--	na	7.2E+03
1,1-Dichloroethylene	0	--	--	na	7.1E+03	--	--	na	3.7E+05	--	--	na	7.1E+02	--	--	na	3.7E+04	--	--	na	3.7E+04
1,2-trans-dichloroethylene	0	--	--	na	1.0E+04	--	--	na	5.2E+05	--	--	na	1.0E+03	--	--	na	5.2E+04	--	--	na	5.2E+04
2,4-Dichlorophenol	0	--	--	na	2.9E+02	--	--	na	1.5E+04	--	--	na	2.9E+01	--	--	na	1.5E+03	--	--	na	1.5E+03
2,4-Dichlorophenoxy acetic acid (2,4-D)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
1,2-Dichloropropane[C]	0	--	--	na	1.5E+02	--	--	na	2.9E+04	--	--	na	1.5E+01	--	--	na	2.9E+03	--	--	na	2.9E+03
1,3-Dichloropropene[C]	0	--	--	na	2.1E+02	--	--	na	4.1E+04	--	--	na	2.1E+01	--	--	na	4.1E+03	--	--	na	4.1E+03
Dieldrin[C]	0	2.4E-01	5.6E-02	na	5.4E-04	2.8E-01	1.0E+00	na	1.1E-01	6.0E-02	1.4E-02	na	5.4E-05	7.0E-01	2.5E-01	na	1.1E-02	2.8E-01	2.5E-01	na	1.1E-02
Diethyl Phthalate	0	--	--	na	4.4E+04	--	--	na	2.3E+06	--	--	na	4.4E+03	--	--	na	2.3E+05	--	--	na	2.3E+05
2,4-Dimethylphenol	0	--	--	na	8.5E+02	--	--	na	4.4E+04	--	--	na	8.5E+01	--	--	na	4.4E+03	--	--	na	4.4E+03
Dimethyl Phthalate	0	--	--	na	1.1E+06	--	--	na	5.7E+07	--	--	na	1.1E+05	--	--	na	5.7E+06	--	--	na	5.7E+06
Di-n-Butyl Phthalate	0	--	--	na	4.5E+03	--	--	na	2.3E+05	--	--	na	4.5E+02	--	--	na	2.3E+04	--	--	na	2.3E+04
2,4 Dinitrophenol	0	--	--	na	5.3E+03	--	--	na	2.8E+05	--	--	na	5.3E+02	--	--	na	2.8E+04	--	--	na	2.8E+04
2-Methyl-4,6-Dinitrophenol	0	--	--	na	2.8E+02	--	--	na	1.5E+04	--	--	na	2.8E+01	--	--	na	1.5E+03	--	--	na	1.5E+03
2,4-Dinitrotoluene[C]	0	--	--	na	3.4E+01	--	--	na	6.6E+03	--	--	na	3.4E+00	--	--	na	6.6E+02	--	--	na	6.6E+02
Dioxin 2,3,7,8-tetrachlorodibenzo-p-dioxin	0	--	--	na	5.1E-08	--	--	na	2.7E-06	--	--	na	5.1E-09	--	--	na	2.7E-07	--	--	na	2.7E-07
1,2-Diphenylhydrazine[C]	0	--	--	na	2.0E+00	--	--	na	3.9E+02	--	--	na	2.0E-01	--	--	na	3.9E+01	--	--	na	3.9E+01
Alpha-Endosulfan	0	2.2E-01	5.6E-02	na	8.9E+01	2.5E-01	1.0E+00	na	4.6E+03	5.5E-02	1.4E-02	na	8.9E+00	6.4E-01	2.5E-01	na	4.6E+02	2.5E-01	2.5E-01	na	4.6E+02
Beta-Endosulfan	0	2.2E-01	5.6E-02	na	8.9E+01	2.5E-01	1.0E+00	na	4.6E+03	5.5E-02	1.4E-02	na	8.9E+00	6.4E-01	2.5E-01	na	4.6E+02	2.5E-01	2.5E-01	na	4.6E+02
Alpha + Beta Endosulfan	0	2.2E-01	5.6E-02	--	--	2.5E-01	1.0E+00	--	--	5.5E-02	1.4E-02	--	--	6.4E-01	2.5E-01	--	--	2.5E-01	2.5E-01	--	--
Endosulfan Sulfate	0	--	--	na	8.9E+01	--	--	na	4.6E+03	--	--	na	8.9E+00	--	--	na	4.6E+02	--	--	na	4.6E+02
Endrin	0	8.6E-02	3.6E-02	na	6.0E-02	9.9E-02	6.4E-01	na	3.1E+00	2.2E-02	9.0E-03	na	6.0E-03	2.5E-01	1.6E-01	na	3.1E-01	9.9E-02	1.6E-01	na	3.1E-01
Endrin Aldehyde	0	--	--	na	3.0E-01	--	--	na	1.6E+01	--	--	na	3.0E-02	--	--	na	1.6E+00	--	--	na	1.6E+00

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
Ethylbenzene	0	--	--	na	2.1E+03	--	--	na	1.1E+05	--	--	na	2.1E+02	--	--	na	1.1E+04	--	--	na	1.1E+04
Fluoranthene	0	--	--	na	1.4E+02	--	--	na	7.3E+03	--	--	na	1.4E+01	--	--	na	7.3E+02	--	--	na	7.3E+02
Fluorene	0	--	--	na	5.3E+03	--	--	na	2.8E+05	--	--	na	5.3E+02	--	--	na	2.8E+04	--	--	na	2.8E+04
Foaming Agents	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Guthion	0	--	1.0E-02	na	--	--	1.8E-01	na	--	--	2.5E-03	na	--	--	4.4E-02	na	--	--	4.4E-02	na	--
Heptachlor [C]	0	5.2E-01	3.8E-03	na	7.9E-04	6.0E-01	6.8E-02	na	1.5E-01	1.3E-01	9.5E-04	na	7.9E-05	1.5E+00	1.7E-02	na	1.5E-02	6.0E-01	1.7E-02	na	1.5E-02
Heptachlor Epoxide[C]	0	5.2E-01	3.8E-03	na	3.9E-04	6.0E-01	6.8E-02	na	7.6E-02	1.3E-01	9.5E-04	na	3.9E-05	1.5E+00	1.7E-02	na	7.6E-03	6.0E-01	1.7E-02	na	7.6E-03
Hexachlorobenzene[C]	0	--	--	na	2.9E-03	--	--	na	5.7E-01	--	--	na	2.9E-04	--	--	na	5.7E-02	--	--	na	5.7E-02
Hexachlorobutadiene[C]	0	--	--	na	1.8E+02	--	--	na	3.5E+04	--	--	na	1.8E+01	--	--	na	3.5E+03	--	--	na	3.5E+03
Hexachlorocyclohexane Alpha-BHC[C]	0	--	--	na	4.9E-02	--	--	na	9.6E+00	--	--	na	4.9E-03	--	--	na	9.6E-01	--	--	na	9.6E-01
Hexachlorocyclohexane Beta-BHC[C]	0	--	--	na	1.7E-01	--	--	na	3.3E+01	--	--	na	1.7E-02	--	--	na	3.3E+00	--	--	na	3.3E+00
Hexachlorocyclohexane Gamma-BHC[C] (Lindane)	0	9.5E-01	na	na	1.8E+00	1.1E+00	--	na	3.5E+02	2.4E-01	--	na	1.8E-01	2.8E+00	--	na	3.5E+01	1.1E+00	--	na	3.5E+01
Hexachlorocyclopentadiene	0	--	--	na	1.1E+03	--	--	na	5.7E+04	--	--	na	1.1E+02	--	--	na	5.7E+03	--	--	na	5.7E+03
Hexachloroethane[C]	0	--	--	na	3.3E+01	--	--	na	6.4E+03	--	--	na	3.3E+00	--	--	na	6.4E+02	--	--	na	6.4E+02
Hydrogen Sulfide	0	--	2.0E+00	na	--	--	3.6E+01	na	--	--	5.0E-01	na	--	--	8.9E+00	na	--	--	8.9E+00	na	--
Indeno (1,2,3-cd) pyrene [C]	0	--	--	na	1.8E-01	--	--	na	3.5E+01	--	--	na	1.8E-02	--	--	na	3.5E+00	--	--	na	3.5E+00
Iron	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Isophorone[C]	0	--	--	na	9.6E+03	--	--	na	1.9E+06	--	--	na	9.6E+02	--	--	na	1.9E+05	--	--	na	1.9E+05
Kepone	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--
Lead	0	5.0E+01	2.5E+00	na	--	5.8E+01	4.5E+01	na	--	5.7E+00	6.3E-01	na	--	6.7E+01	1.1E+01	na	--	5.8E+01	1.1E+01	na	--
Malathion	0	--	1.0E-01	na	--	--	1.8E+00	na	--	--	2.5E-02	na	--	--	4.4E-01	na	--	--	4.4E-01	na	--
Manganese	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Mercury	0	1.4E+00	7.7E-01	--	--	1.6E+00	1.4E+01	--	--	3.5E-01	1.9E-01	--	--	4.1E+00	3.4E+00	--	--	1.6E+00	3.4E+00	--	--
Methyl Bromide	0	--	--	na	1.5E+03	--	--	na	7.8E+04	--	--	na	1.5E+02	--	--	na	7.8E+03	--	--	na	7.8E+03
Methylene Chloride [C]	0	--	--	na	5.9E+03	--	--	na	1.2E+06	--	--	na	5.9E+02	--	--	na	1.2E+05	--	--	na	1.2E+05
Methoxychlor	0	--	3.0E-02	na	--	--	5.3E-01	na	--	--	7.5E-03	na	--	--	1.3E-01	na	--	--	1.3E-01	na	--
Mirex	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--
Nickel	0	1.0E+02	6.6E+00	na	4.6E+03	1.2E+02	1.2E+02	na	2.4E+05	1.5E+01	1.7E+00	na	4.6E+02	1.8E+02	2.9E+01	na	2.4E+04	1.2E+02	2.9E+01	na	2.4E+04
Nitrate (as N)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Nitrobenzene	0	--	--	na	6.9E+02	--	--	na	3.6E+04	--	--	na	6.9E+01	--	--	na	3.6E+03	--	--	na	3.6E+03
N-Nitrosodimethylamine[C]	0	--	--	na	3.0E+01	--	--	na	5.9E+03	--	--	na	3.0E+00	--	--	na	5.9E+02	--	--	na	5.9E+02
N-Nitrosodiphenylamine[C]	0	--	--	na	6.0E+01	--	--	na	1.2E+04	--	--	na	6.0E+00	--	--	na	1.2E+03	--	--	na	1.2E+03
N-Nitrosodi-n-propylamine[C]	0	--	--	na	5.1E+00	--	--	na	1.0E+03	--	--	na	5.1E-01	--	--	na	1.0E+02	--	--	na	1.0E+02
Nonylphenol	0	2.8E+01	6.6E+00	--	--	3.2E+01	1.2E+02	na	--	7.0E+00	1.7E+00	--	--	8.1E+01	2.9E+01	--	--	3.2E+01	2.9E+01	na	--
Parathion	0	6.5E-02	1.3E-02	na	--	7.5E-02	2.3E-01	na	--	1.6E-02	3.3E-03	na	--	1.9E-01	5.8E-02	na	--	7.5E-02	5.8E-02	na	--
PCB Total[C]	0	--	1.4E-02	na	6.4E-04	--	2.5E-01	na	1.3E-01	--	3.5E-03	na	6.4E-05	--	6.2E-02	na	1.3E-02	--	6.2E-02	na	1.3E-02
Pentachlorophenol [C]	0	7.7E-03	5.9E-03	na	3.0E+01	8.9E-03	1.0E-01	na	5.9E+03	1.9E-03	1.5E-03	na	3.0E+00	2.2E-02	2.6E-02	na	5.9E+02	8.9E-03	2.6E-02	na	5.9E+02
Phenol	0	--	--	na	8.6E+05	--	--	na	4.5E+07	--	--	na	8.6E+04	--	--	na	4.5E+06	--	--	na	4.5E+06
Pyrene	0	--	--	na	4.0E+03	--	--	na	2.1E+05	--	--	na	4.0E+02	--	--	na	2.1E+04	--	--	na	2.1E+04
Radionuclides	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Gross Alpha Activity (pCi/L)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Beta and Photon Activity (mrem/yr)	0	--	--	na	4.0E+00	--	--	na	2.1E+02	--	--	na	4.0E-01	--	--	na	2.1E+01	--	--	na	2.1E+01
Radium 226 + 228 (pCi/L)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Uranium (ug/l)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
Selenium, Total Recoverable	0	2.0E+01	5.0E+00	na	4.2E+03	2.3E+01	8.9E+01	na	2.2E+05	5.0E+00	1.3E+00	na	4.2E+02	5.8E+01	2.2E+01	na	2.2E+04	**2.3E+01**	**2.2E+01**	**na**	**2.2E+04**
Silver	0	1.1E+00	--	na	--	1.2E+00	--	na	--	9.4E-02	--	na	--	1.1E+00	--	na	--	**1.1E+00**	**--**	**na**	**--**
Sulfate	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
1,1,2,2-Tetrachloroethane[C]	0	--	--	na	4.0E+01	--	--	na	7.8E+03	--	--	na	4.0E+00	--	--	na	7.8E+02	**--**	**--**	**na**	**7.8E+02**
Tetrachloroethylene[C]	0	--	--	na	3.3E+01	--	--	na	6.4E+03	--	--	na	3.3E+00	--	--	na	6.4E+02	**--**	**--**	**na**	**6.4E+02**
Thallium	0	--	--	na	4.7E-01	--	--	na	2.5E+01	--	--	na	4.7E-02	--	--	na	2.5E+00	**--**	**--**	**na**	**2.5E+00**
Toluene	0	--	--	na	6.0E+03	--	--	na	3.1E+05	--	--	na	6.0E+02	--	--	na	3.1E+04	**--**	**--**	**na**	**3.1E+04**
Total dissolved solids	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Toxaphene [C]	0	7.3E-01	2.0E-04	na	2.8E-03	8.4E-01	3.6E-03	na	5.5E-01	1.8E-01	5.0E-05	na	2.8E-04	2.1E+00	8.9E-04	na	5.5E-02	**8.4E-01**	**8.9E-04**	**na**	**5.5E-02**
Tributyltin	0	4.6E-01	7.2E-02	na	--	5.3E-01	1.3E+00	na	--	1.2E-01	1.8E-02	na	--	1.3E+00	3.2E-01	na	--	**5.3E-01**	**3.2E-01**	**na**	**--**
1,2,4-Trichlorobenzene	0	--	--	na	7.0E+01	--	--	na	3.7E+03	--	--	na	7.0E+00	--	--	na	3.7E+02	**--**	**--**	**na**	**3.7E+02**
1,1,2-Trichloroethane[C]	0	--	--	na	1.6E+02	--	--	na	3.1E+04	--	--	na	1.6E+01	--	--	na	3.1E+03	**--**	**--**	**na**	**3.1E+03**
Trichloroethylene [C]	0	--	--	na	3.0E+02	--	--	na	5.9E+04	--	--	na	3.0E+01	--	--	na	5.9E+03	**--**	**--**	**na**	**5.9E+03**
2,4,6-Trichlorophenol [C]	0	--	--	na	2.4E+01	--	--	na	4.7E+03	--	--	na	2.4E+00	--	--	na	4.7E+02	**--**	**--**	**na**	**4.7E+02**
2-(2,4,5-Trichlorophenoxy) propionic acid (Silvex)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Vinyl Chloride[C]	0	--	--	na	2.4E+01	--	--	na	4.7E+03	--	--	na	2.4E+00	--	--	na	4.7E+02	**--**	**--**	**na**	**4.7E+02**
Zinc	0	6.6E+01	3.8E+01	na	2.6E+04	7.6E+01	6.8E+02	na	1.4E+06	9.8E+00	9.6E+00	na	2.6E+03	1.1E+02	1.7E+02	na	1.4E+05	**7.6E+01**	**1.7E+02**	**na**	**1.4E+05**

Notes:

1. All concentrations expressed as micrograms/liter (ug/l), unless noted otherwise
2. Discharge flow is highest monthly average or Form 2C maximum for Industries and design flow for Municipals
3. Metals measured as Dissolved, unless specified otherwise
4. "C" indicates a carcinogenic parameter
5. Regular WLAs are mass balances (minus background concentration) using the % of stream flow entered above under Mixing Information.
   Antidegradation WLAs are based upon a complete mix.
6. Antideg. Baseline = (0.25(WQC - background conc.) + background conc.) for acute and chronic
   = (0.1(WQC - background conc.) + background conc.) for human health
7. WLAs established at the following stream flows: 1Q10 for Acute, 30Q10 for Chronic Ammonia, 7Q10 for Other Chronic, 30Q5 for Non-carcinogens and Harmonic Mean for Carcinogens. To apply mixing ratios from a model set the stream flow equal to (mixing ratio - 1), effluent flow equal to 1 and 100% mix.

Metal	Target Value (SSTV)
Antimony	3.3E+03
Arsenic	1.6E+02
Barium	na
Cadmium	8.4E-01
Chromium III	6.7E+01
Chromium VI	7.4E+00
Copper	3.3E+00
Iron	na
Lead	6.7E+00
Manganese	na
Mercury	6.5E-01
Nickel	1.8E+01
Selenium	9.3E+00
Silver	4.4E-01
Zinc	3.0E+01

Note: do not use QL's lower than the minimum QL's provided in agency guidance

Mixing Zone Predictions for Wilderness WWTP

Effluent Flow = .715 MGD
Stream 7Q10 = 12 MGD
Stream 30Q10 = 21.7 MGD
Stream 1Q10 = 7.6 MGD
Stream slope = .004 ft/ft
Stream width = 200 ft
Bottom scale = 4
Channel scale = 2

Mixing Zone Predictions @ 7Q10

Depth = .3159 ft
Length = 52156.39 ft
Velocity = .3115 ft/sec
Residence Time = 1.9376 days

Recommendation:

A complete mix assumption is appropriate for this situation and the entire 7Q10 may be used.

Mixing Zone Predictions @ 30Q10

Depth = .4441 ft
Length = 39232.1 ft
Velocity = .3907 ft/sec
Residence Time = 1.1623 days

Recommendation:

A complete mix assumption is appropriate for this situation and the entire 30Q10 may be used.

Mixing Zone Predictions @ 1Q10

Depth = .2448 ft
Length = 64541.9 ft
Velocity = .2629 ft/sec
Residence Time = 68.1822 hours

Recommendation:

A complete mix assumption is appropriate for this situation providing no more than 1.47% of the 1Q10 is used.

Virginia DEQ Mixing Zone Analysis Version 2.1

Mixing Zone Predictions for Wilderness WWTP

Effluent Flow = .715 MGD
Stream 7Q10 = 76 MGD
Stream 30Q10 = 102.3 MGD
Stream 1Q10 = 55.7 MGD
Stream slope = .004 ft/ft
Stream width = 200 ft
Bottom scale = 4
Channel scale = 2

Mixing Zone Predictions @ 7Q10

Depth = .931 ft
Length = 21104.27 ft
Velocity = .6378 ft/sec
Residence Time = .383 days

Recommendation:

A complete mix assumption is appropriate for this situation and the entire 7Q10 may be used.

Mixing Zone Predictions @ 30Q10

Depth = 1.1119 ft
Length = 18179.53 ft
Velocity = .7171 ft/sec
Residence Time = .2934 days

Recommendation:

A complete mix assumption is appropriate for this situation and the entire 30Q10 may be used.

Mixing Zone Predictions @ 1Q10

Depth = .7737 ft
Length = 24648.5 ft
Velocity = .5644 ft/sec
Residence Time = 12.1317 hours

Recommendation:

A complete mix assumption is appropriate for this situation providing no more than 8.24% of the 1Q10 is used.

Virginia DEQ Mixing Zone Analysis Version 2.1

FRESHWATER
WATER QUALITY CRITERIA / WASTELOAD ALLOCATION ANALYSIS

Facility Name: Wilderness WWTP 2 MGD Permit No.: VA0083411

Receiving Stream: Rapidan River Version: OWP Guidance Memo 00-2011 (8/24/00)

Stream Information

Mean Hardness (as CaCO3) =	24.92	mg/L
90% Temperature (Annual) =	19.9	deg C
90% Temperature (Wet season) =	25.5	deg C
90% Maximum pH =	7.9	SU
10% Maximum pH =		SU
Tier Designation (1 or 2) =	2	
Public Water Supply (PWS) Y/N? =	n	
Trout Present Y/N? =	n	
Early Life Stages Present Y/N? =	y	

Stream Flows

1Q10 (Annual) =	7.6	MGD
7Q10 (Annual) =	12	MGD
30Q10 (Annual) =	21.7	MGD
1Q10 (Wet season) =	55.7	MGD
30Q10 (Wet season)	102.3	MGD
30Q5 =	36.6	MGD
Harmonic Mean =	139	MGD

Mixing Information

Annual - 1Q10 Mix =	1.67	%
- 7Q10 Mix =	100	%
- 30Q10 Mix =	100	%
Wet Season - 1Q10 Mix =	8.41	%
- 30Q10 Mix =	100	%

Effluent Information

Mean Hardness (as CaCO3) =	100	mg/L
90% Temp (Annual) =	19.9	deg C
90% Temp (Wet season) =	25	deg C
90% Maximum pH =	7.5	SU
10% Maximum pH =		SU
Discharge Flow =	2	MGD

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Acenapthene	0	--	--	na	9.9E+02	--	--	na	1.9E+04	--	--	na	9.9E+01	--	--	na	1.9E+03	--	--	na	**1.9E+03**
Acrolein	0	--	--	na	9.3E+00	--	--	na	1.8E+02	--	--	na	9.3E-01	--	--	na	1.8E+01	--	--	na	**1.8E+01**
Acrylonitrile[C]	0	--	--	na	2.5E+00	--	--	na	1.8E+02	--	--	na	2.5E-01	--	--	na	1.8E+01	--	--	na	**1.8E+01**
Aldrin [C]	0	3.0E+00	--	na	5.0E-04	3.2E+00	--	na	3.5E-02	7.5E-01	--	na	5.0E-05	3.6E+00	--	na	3.5E-03	**3.2E+00**	--	na	**3.5E-03**
Ammonia-N (mg/l) (Yearly)	0	1.94E+01	2.12E+00	na	--	2.1E+01	2.5E+01	na	--	3.14E+00	5.29E-01	na	--	1.5E+01	6.3E+00	na	--	**1.5E+01**	**6.3E+00**	na	--
Ammonia-N (mg/l) (High Flow)	0	1.35E+01	1.40E+00	na	--	4.5E+01	7.3E+01	na	--	2.64E+00	3.51E-01	na	--	7.6E+01	1.8E+01	na	--	**4.5E+01**	**1.8E+01**	na	--
Anthracene	0	--	--	na	4.0E+04	--	--	na	7.7E+05	--	--	na	4.0E+03	--	--	na	7.7E+04	--	--	na	**7.7E+04**
Antimony	0	--	--	na	6.4E+02	--	--	na	1.2E+04	--	--	na	6.4E+01	--	--	na	1.2E+03	--	--	na	**1.2E+03**
Arsenic	0	3.4E+02	1.5E+02	na	--	3.6E+02	1.1E+03	na	--	8.5E+01	3.8E+01	na	--	4.1E+02	2.6E+02	na	--	**3.6E+02**	**2.6E+02**	na	--
Barium	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Benzene [C]	0	--	--	na	5.1E+02	--	--	na	3.6E+04	--	--	na	5.1E+01	--	--	na	3.6E+03	--	--	na	**3.6E+03**
Benzidine[C]	0	--	--	na	2.0E-03	--	--	na	1.4E-01	--	--	na	2.0E-04	--	--	na	1.4E-02	--	--	na	**1.4E-02**
Benzo (a) anthracene [C]	0	--	--	na	1.8E-01	--	--	na	1.3E+01	--	--	na	1.8E-02	--	--	na	1.3E+00	--	--	na	**1.3E+00**
Benzo (b) fluoranthene [C]	0	--	--	na	1.8E-01	--	--	na	1.3E+01	--	--	na	1.8E-02	--	--	na	1.3E+00	--	--	na	**1.3E+00**
Benzo (k) fluoranthene [C]	0	--	--	na	1.8E-01	--	--	na	1.3E+01	--	--	na	1.8E-02	--	--	na	1.3E+00	--	--	na	**1.3E+00**
Benzo (a) pyrene [C]	0	--	--	na	1.8E-01	--	--	na	1.3E+01	--	--	na	1.8E-02	--	--	na	1.3E+00	--	--	na	**1.3E+00**
Bis2-Chloroethyl Ether[C]	0	--	--	na	5.3E+00	--	--	na	3.7E+02	--	--	na	5.3E-01	--	--	na	3.7E+01	--	--	na	**3.7E+01**
Bis2-Chloroisopropyl Ether	0	--	--	na	6.5E+04	--	--	na	1.3E+06	--	--	na	6.5E+03	--	--	na	1.3E+05	--	--	na	**1.3E+05**
Bis 2-Ethylhexyl Phthalate [C]	0	--	--	na	2.2E+01	--	--	na	1.6E+03	--	--	na	2.2E+00	--	--	na	1.6E+02	--	--	na	**1.6E+02**
Bromoform [C]	0	--	--	na	1.4E+03	--	--	na	9.9E+04	--	--	na	1.4E+02	--	--	na	9.9E+03	--	--	na	**9.9E+03**
Butylbenzylphthalate	0	--	--	na	1.9E+03	--	--	na	3.7E+04	--	--	na	1.9E+02	--	--	na	3.7E+03	--	--	na	**3.7E+03**
Cadmium	0	3.7E+00	5.0E-01	na	--	4.0E+00	3.5E+00	na	--	3.5E-01	1.3E-01	na	--	1.7E+00	8.8E-01	na	--	**1.7E+00**	**8.8E-01**	na	--
Carbon Tetrachloride [C]	0	--	--	na	1.6E+01	--	--	na	1.1E+03	--	--	na	1.6E+00	--	--	na	1.1E+02	--	--	na	**1.1E+02**
Chlordane [C]	0	2.4E+00	4.3E-03	na	8.1E-03	2.6E+00	3.0E-02	na	5.7E-01	6.0E-01	1.1E-03	na	8.1E-04	2.9E+00	7.5E-03	na	5.7E-02	**2.6E+00**	**7.5E-03**	na	**5.7E-02**
Chloride	0	8.6E+05	2.3E+05	na	--	9.1E+05	1.6E+06	na	--	2.2E+05	5.8E+04	na	--	1.0E+06	4.0E+05	na	--	**9.1E+05**	**4.0E+05**	na	--
TRC	0	1.9E+01	1.1E+01	na	--	2.0E+01	7.7E+01	na	--	4.8E+00	2.8E+00	na	--	2.3E+01	1.9E+01	na	--	**2.0E+01**	**1.9E+01**	na	--
Chlorobenzene	0	--	--	na	1.6E+03	--	--	na	3.1E+04	--	--	na	1.6E+02	--	--	na	3.1E+03	--	--	na	**3.1E+03**

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
Chlorodibromomethane[C]	0	--	--	na	1.3E+02	--	--	na	9.2E+03	--	--	na	1.3E+01	--	--	na	9.2E+02	--	--	na	9.2E+02
Chloroform	0	--	--	na	1.1E+04	--	--	na	2.1E+05	--	--	na	1.1E+03	--	--	na	2.1E+04	--	--	na	2.1E+04
2-Chloronaphthalene	0	--	--	na	1.6E+03	--	--	na	3.1E+04	--	--	na	1.6E+02	--	--	na	3.1E+03	--	--	na	3.1E+03
2-Chlorophenol	0	--	--	na	1.5E+02	--	--	na	2.9E+03	--	--	na	1.5E+01	--	--	na	2.9E+02	--	--	na	2.9E+02
Chlorpyrifos	0	8.3E-02	4.1E-02	na	--	8.8E-02	2.9E-01	na	--	2.1E-02	1.0E-02	na	--	1.0E-01	7.2E-02	na	--	8.8E-02	7.2E-02	na	--
Chromium III	0	5.5E+02	3.2E+01	na	--	5.8E+02	2.2E+02	na	--	6.8E+01	8.0E+00	na	--	3.3E+02	5.6E+01	na	--	3.3E+02	5.6E+01	na	--
Chromium VI	0	1.6E+01	1.1E+01	na	--	1.7E+01	7.7E+01	na	--	4.0E+00	2.8E+00	na	--	1.9E+01	1.9E+01	na	--	1.7E+01	1.9E+01	na	--
Chromium, Total	0	--	--	1.0E+02	--	--	--	na	--	--	--	1.0E+01	--	--	--	1.9E+02	--	--	--	na	--
Chrysene[C]	0	--	--	na	1.8E-02	--	--	na	1.3E+00	--	--	na	1.8E-03	--	--	na	1.3E-01	--	--	na	1.3E-01
Copper	0	1.3E+01	3.7E+00	na	--	1.4E+01	2.6E+01	na	--	1.4E+00	9.3E-01	na	--	6.9E+00	6.5E+00	na	--	6.9E+00	6.5E+00	na	--
Cyanide, Free	0	2.2E+01	5.2E+00	na	1.6E+04	2.3E+01	3.6E+01	na	3.1E+05	5.5E+00	1.3E+00	na	1.6E+03	2.6E+01	9.1E+00	na	3.1E+04	2.3E+01	9.1E+00	na	3.1E+04
DDD[C]	0	--	--	na	3.1E-03	--	--	na	2.2E-01	--	--	na	3.1E-04	--	--	na	2.2E-02	--	--	na	2.2E-02
DDE[C]	0	--	--	na	2.2E-03	--	--	na	1.6E-01	--	--	na	2.2E-04	--	--	na	1.6E-02	--	--	na	1.6E-02
DDT[C]	0	1.1E+00	1.0E-03	na	2.2E-03	1.2E+00	7.0E-03	na	1.6E-01	2.8E-01	2.5E-04	na	2.2E-04	1.3E+00	1.8E-03	na	1.6E-02	1.2E+00	1.8E-03	na	1.6E-02
Demeton	0	--	1.0E-01	na	--	--	7.0E-01	na	--	--	2.5E-02	na	--	--	1.8E-01	na	--	--	1.8E-01	na	--
Diazinon	0	1.7E-01	1.7E-01	na	--	1.8E-01	1.2E+00	na	--	4.3E-02	4.3E-02	na	--	2.0E-01	3.0E-01	na	--	1.8E-01	3.0E-01	na	--
Dibenz(a,h)anthracene[C]	0	--	--	na	1.8E-01	--	--	na	1.3E+01	--	--	na	1.8E-02	--	--	na	1.3E+00	--	--	na	1.3E+00
1,2-Dichlorobenzene	0	--	--	na	1.3E+03	--	--	na	2.5E+04	--	--	na	1.3E+02	--	--	na	2.5E+03	--	--	na	2.5E+03
1,3-Dichlorobenzene	0	--	--	na	9.6E+02	--	--	na	1.9E+04	--	--	na	9.6E+01	--	--	na	1.9E+03	--	--	na	1.9E+03
1,4-Dichlorobenzene	0	--	--	na	1.9E+02	--	--	na	3.7E+03	--	--	na	1.9E+01	--	--	na	3.7E+02	--	--	na	3.7E+02
3,3-Dichlorobenzidine[C]	0	--	--	na	2.8E-01	--	--	na	2.0E+01	--	--	na	2.8E-02	--	--	na	2.0E+00	--	--	na	2.0E+00
Dichlorobromomethane[C]	0	--	--	na	1.7E+02	--	--	na	1.2E+04	--	--	na	1.7E+01	--	--	na	1.2E+03	--	--	na	1.2E+03
1,2-Dichloroethane[C]	0	--	--	na	3.7E+02	--	--	na	2.6E+04	--	--	na	3.7E+01	--	--	na	2.6E+03	--	--	na	2.6E+03
1,1-Dichloroethylene	0	--	--	na	7.1E+03	--	--	na	1.4E+05	--	--	na	7.1E+02	--	--	na	1.4E+04	--	--	na	1.4E+04
1,2-trans-dichloroethylene	0	--	--	na	1.0E+04	--	--	na	1.9E+05	--	--	na	1.0E+03	--	--	na	1.9E+04	--	--	na	1.9E+04
2,4-Dichlorophenol	0	--	--	na	2.9E+02	--	--	na	5.6E+03	--	--	na	2.9E+01	--	--	na	5.6E+02	--	--	na	5.6E+02
2,4-Dichlorophenoxy acetic acid (2,4-D)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
1,2-Dichloropropane[C]	0	--	--	na	1.5E+02	--	--	na	1.1E+04	--	--	na	1.5E+01	--	--	na	1.1E+03	--	--	na	1.1E+03
1,3-Dichloropropene[C]	0	--	--	na	2.1E+02	--	--	na	1.5E+04	--	--	na	2.1E+01	--	--	na	1.5E+03	--	--	na	1.5E+03
Dieldrin[C]	0	2.4E-01	5.6E-02	na	5.4E-04	2.6E-01	3.9E-01	na	3.8E-02	6.0E-02	1.4E-02	na	5.4E-05	2.9E-01	9.8E-02	na	3.8E-03	2.6E-01	9.8E-02	na	3.8E-03
Diethyl Phthalate	0	--	--	na	4.4E+04	--	--	na	8.5E+05	--	--	na	4.4E+03	--	--	na	8.5E+04	--	--	na	8.5E+04
2,4-Dimethylphenol	0	--	--	na	8.5E+02	--	--	na	1.6E+04	--	--	na	8.5E+01	--	--	na	1.6E+03	--	--	na	1.6E+03
Dimethyl Phthalate	0	--	--	na	1.1E+06	--	--	na	2.1E+07	--	--	na	1.1E+05	--	--	na	2.1E+06	--	--	na	2.1E+06
Di-n-Butyl Phthalate	0	--	--	na	4.5E+03	--	--	na	8.7E+04	--	--	na	4.5E+02	--	--	na	8.7E+03	--	--	na	8.7E+03
2,4 Dinitrophenol	0	--	--	na	5.3E+03	--	--	na	1.0E+05	--	--	na	5.3E+02	--	--	na	1.0E+04	--	--	na	1.0E+04
2-Methyl-4,6-Dinitrophenol	0	--	--	na	2.8E+02	--	--	na	5.4E+03	--	--	na	2.8E+01	--	--	na	5.4E+02	--	--	na	5.4E+02
2,4-Dinitrotoluene[C]	0	--	--	na	3.4E+01	--	--	na	2.4E+03	--	--	na	3.4E+00	--	--	na	2.4E+02	--	--	na	2.4E+02
Dioxin 2,3,7,8-tetrachlorodibenzo-p-dioxin	0	--	--	na	5.1E-08	--	--	na	9.8E-07	--	--	na	5.1E-09	--	--	na	9.8E-08	--	--	na	9.8E-08
1,2-Diphenylhydrazine[C]	0	--	--	na	2.0E+00	--	--	na	1.4E+02	--	--	na	2.0E-01	--	--	na	1.4E+01	--	--	na	1.4E+01
Alpha-Endosulfan	0	2.2E-01	5.6E-02	na	8.9E+01	2.3E-01	3.9E-01	na	1.7E+03	5.5E-02	1.4E-02	na	8.9E+00	2.6E-01	9.8E-02	na	1.7E+02	2.3E-01	9.8E-02	na	1.7E+02
Beta-Endosulfan	0	2.2E-01	5.6E-02	na	8.9E+01	2.3E-01	3.9E-01	na	1.7E+03	5.5E-02	1.4E-02	na	8.9E+00	2.6E-01	9.8E-02	na	1.7E+02	2.3E-01	9.8E-02	na	1.7E+02
Alpha + Beta Endosulfan	0	2.2E-01	5.6E-02	--	--	2.3E-01	3.9E-01	--	--	5.5E-02	1.4E-02	--	--	2.6E-01	9.8E-02	--	--	2.3E-01	9.8E-02	--	--
Endosulfan Sulfate	0	--	--	na	8.9E+01	--	--	na	1.7E+03	--	--	na	8.9E+00	--	--	na	1.7E+02	--	--	na	1.7E+02
Endrin	0	8.6E-02	3.6E-02	na	6.0E-02	9.1E-02	2.5E-01	na	1.2E+00	2.2E-02	9.0E-03	na	6.0E-03	1.0E-01	6.3E-02	na	1.2E-01	9.1E-02	6.3E-02	na	1.2E-01
Endrin Aldehyde	0	--	--	na	3.0E-01	--	--	na	5.8E+00	--	--	na	3.0E-02	--	--	na	5.8E-01	--	--	na	5.8E-01

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
Ethylbenzene	0	--	--	na	2.1E+03	--	--	na	4.1E+04	--	--	na	2.1E+02	--	--	na	4.1E+03	--	--	na	4.1E+03
Fluoranthene	0	--	--	na	1.4E+02	--	--	na	2.7E+03	--	--	na	1.4E+01	--	--	na	2.7E+02	--	--	na	2.7E+02
Fluorene	0	--	--	na	5.3E+03	--	--	na	1.0E+05	--	--	na	5.3E+02	--	--	na	1.0E+04	--	--	na	1.0E+04
Foaming Agents	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Guthion	0	--	1.0E-02	na	--	--	7.0E-02	na	--	--	2.5E-03	na	--	--	1.8E-02	na	--	--	1.8E-02	na	--
Heptachlor [C]	0	5.2E-01	3.8E-03	na	7.9E-04	5.5E-01	2.7E-02	na	5.6E-02	1.3E-01	9.5E-04	na	7.9E-05	6.2E-01	6.7E-03	na	5.6E-03	5.5E-01	6.7E-03	na	5.6E-03
Heptachlor Epoxide [C]	0	5.2E-01	3.8E-03	na	3.9E-04	5.5E-01	2.7E-02	na	2.7E-02	1.3E-01	9.5E-04	na	3.9E-05	6.2E-01	6.7E-03	na	2.7E-03	5.5E-01	6.7E-03	na	2.7E-03
Hexachlorobenzene [C]	0	--	--	na	2.9E-03	--	--	na	2.0E-01	--	--	na	2.9E-04	--	--	na	2.0E-02	--	--	na	2.0E-02
Hexachlorobutadiene [C]	0	--	--	na	1.8E+02	--	--	na	1.3E+04	--	--	na	1.8E+01	--	--	na	1.3E+03	--	--	na	1.3E+03
Hexachlorocyclohexane Alpha-BHC [C]	0	--	--	na	4.9E-02	--	--	na	3.5E+00	--	--	na	4.9E-03	--	--	na	3.5E-01	--	--	na	3.5E-01
Hexachlorocyclohexane Beta-BHC [C]	0	--	--	na	1.7E-01	--	--	na	1.2E+01	--	--	na	1.7E-02	--	--	na	1.2E+00	--	--	na	1.2E+00
Hexachlorocyclohexane Gamma-BHC [C] (Lindane)	0	9.5E-01	na	na	1.8E+00	1.0E+00	--	na	1.3E+02	2.4E-01	--	na	1.8E-01	1.1E+00	--	na	1.3E+01	1.0E+00	--	na	1.3E+01
Hexachlorocyclopentadiene	0	--	--	na	1.1E+03	--	--	na	2.1E+04	--	--	na	1.1E+02	--	--	na	2.1E+03	--	--	na	2.1E+03
Hexachloroethane [C]	0	--	--	na	3.3E+01	--	--	na	2.3E+03	--	--	na	3.3E+00	--	--	na	2.3E+02	--	--	na	2.3E+02
Hydrogen Sulfide	0	--	2.0E+00	na	--	--	1.4E+01	na	--	--	5.0E-01	na	--	--	3.5E+00	na	--	--	3.5E+00	na	--
Indeno (1,2,3-cd) pyrene [C]	0	--	--	na	1.8E-01	--	--	na	1.3E+01	--	--	na	1.8E-02	--	--	na	1.3E+00	--	--	na	1.3E+00
Iron	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Isophorone [C]	0	--	--	na	9.6E+03	--	--	na	6.8E+05	--	--	na	9.6E+02	--	--	na	6.8E+04	--	--	na	6.8E+04
Kepone	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--
Lead	0	1.1E+02	3.6E+00	na	--	1.2E+02	2.5E+01	na	--	9.4E+00	9.1E-01	na	--	4.5E+01	6.4E+00	na	--	4.5E+01	6.4E+00	na	--
Malathion	0	--	1.0E-01	na	--	--	7.0E-01	na	--	--	2.5E-02	na	--	--	1.8E-01	na	--	--	1.8E-01	na	--
Manganese	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Mercury	0	1.4E+00	7.7E-01	--	--	1.5E+00	5.4E+00	--	--	3.5E-01	1.9E-01	--	--	1.7E+00	1.3E+00	--	--	1.5E+00	1.3E+00	--	--
Methyl Bromide	0	--	--	na	1.5E+03	--	--	na	2.9E+04	--	--	na	1.5E+02	--	--	na	2.9E+03	--	--	na	2.9E+03
Methylene Chloride [C]	0	--	--	na	5.9E+03	--	--	na	4.2E+05	--	--	na	5.9E+02	--	--	na	4.2E+04	--	--	na	4.2E+04
Methoxychlor	0	--	3.0E-02	na	--	--	2.1E-01	na	--	--	7.5E-03	na	--	--	5.3E-02	na	--	--	5.3E-02	na	--
Mirex	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--
Nickel	0	1.8E+02	8.5E+00	na	4.6E+03	1.9E+02	5.9E+01	na	8.9E+04	2.1E+01	2.1E+00	na	4.6E+02	1.0E+02	1.5E+01	na	8.9E+03	1.0E+02	1.5E+01	na	8.9E+03
Nitrate (as N)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Nitrobenzene	0	--	--	na	6.9E+02	--	--	na	1.3E+04	--	--	na	6.9E+01	--	--	na	1.3E+03	--	--	na	1.3E+03
N-Nitrosodimethylamine [C]	0	--	--	na	3.0E+01	--	--	na	2.1E+03	--	--	na	3.0E+00	--	--	na	2.1E+02	--	--	na	2.1E+02
N-Nitrosodiphenylamine [C]	0	--	--	na	6.0E+01	--	--	na	4.2E+03	--	--	na	6.0E+00	--	--	na	4.2E+02	--	--	na	4.2E+02
N-Nitrosodi-n-propylamine [C]	0	--	--	na	5.1E+00	--	--	na	3.6E+02	--	--	na	5.1E-01	--	--	na	3.6E+01	--	--	na	3.6E+01
Nonylphenol	0	2.8E+01	6.6E+00	--	--	3.0E+01	4.6E+01	na	--	7.0E+00	1.7E+00	--	--	3.4E+01	1.2E+01	--	--	3.0E+01	1.2E+01	na	--
Parathion	0	6.5E-02	1.3E-02	na	--	6.9E-02	9.1E-02	na	--	1.6E-02	3.3E-03	na	--	7.8E-02	2.3E-02	na	--	6.9E-02	2.3E-02	na	--
PCB Total [C]	0	--	1.4E-02	na	6.4E-04	--	9.8E-02	na	4.5E-02	--	3.5E-03	na	6.4E-05	--	2.5E-02	na	4.5E-03	--	2.5E-02	na	4.5E-03
Pentachlorophenol [C]	0	7.7E-03	5.9E-03	na	3.0E+01	8.2E-03	4.1E-02	na	2.1E+03	1.9E-03	1.5E-03	na	3.0E+00	9.2E-03	1.0E-02	na	2.1E+02	8.2E-03	1.0E-02	na	2.1E+02
Phenol	0	--	--	na	8.6E+05	--	--	na	1.7E+07	--	--	na	8.6E+04	--	--	na	1.7E+06	--	--	na	1.7E+06
Pyrene	0	--	--	na	4.0E+03	--	--	na	7.7E+04	--	--	na	4.0E+02	--	--	na	7.7E+03	--	--	na	7.7E+03
Radionuclides	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Gross Alpha Activity (pCi/L)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Beta and Photon Activity (mrem/yr)	0	--	--	na	4.0E+00	--	--	na	7.7E+01	--	--	na	4.0E-01	--	--	na	7.7E+00	--	--	na	7.7E+00
Radium 226 + 228 (pCi/L)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Uranium (ug/l)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Selenium, Total Recoverable	0	2.0E+01	5.0E+00	na	4.2E+03	2.1E+01	3.5E+01	na	8.1E+04	5.0E+00	1.3E+00	na	4.2E+02	2.4E+01	8.8E+00	na	8.1E+03	**2.1E+01**	**8.8E+00**	**na**	**8.1E+03**
Silver	0	3.2E+00	--	na	--	3.4E+00	--	na	--	1.8E-01	--	na	--	8.8E-01	--	na	--	**8.8E-01**	**--**	**na**	**--**
Sulfate	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
1,1,2,2-Tetrachloroethane[C]	0	--	--	na	4.0E+01	--	--	na	2.8E+03	--	--	na	4.0E+00	--	--	na	2.8E+02	**--**	**--**	**na**	**2.8E+02**
Tetrachloroethylene[C]	0	--	--	na	3.3E+01	--	--	na	2.3E+03	--	--	na	3.3E+00	--	--	na	2.3E+02	**--**	**--**	**na**	**2.3E+02**
Thallium	0	--	--	na	4.7E-01	--	--	na	9.1E+00	--	--	na	4.7E-02	--	--	na	9.1E-01	**--**	**--**	**na**	**9.1E-01**
Toluene	0	--	--	na	6.0E+03	--	--	na	1.2E+05	--	--	na	6.0E+02	--	--	na	1.2E+04	**--**	**--**	**na**	**1.2E+04**
Total dissolved solids	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Toxaphene [C]	0	7.3E-01	2.0E-04	na	2.8E-03	7.8E-01	1.4E-03	na	2.0E-01	1.8E-01	5.0E-05	na	2.8E-04	8.8E-01	3.5E-04	na	2.0E-02	**7.8E-01**	**3.5E-04**	**na**	**2.0E-02**
Tributyltin	0	4.6E-01	7.2E-02	na	--	4.9E-01	5.0E-01	na	--	1.2E-01	1.8E-02	na	--	5.5E-01	1.3E-01	na	--	**4.9E-01**	**1.3E-01**	**na**	**--**
1,2,4-Trichlorobenzene	0	--	--	na	7.0E+01	--	--	na	1.4E+03	--	--	na	7.0E+00	--	--	na	1.4E+02	**--**	**--**	**na**	**1.4E+02**
1,1,2-Trichloroethane[C]	0	--	--	na	1.6E+02	--	--	na	1.1E+04	--	--	na	1.6E+01	--	--	na	1.1E+03	**--**	**--**	**na**	**1.1E+03**
Trichloroethylene [C]	0	--	--	na	3.0E+02	--	--	na	2.1E+04	--	--	na	3.0E+01	--	--	na	2.1E+03	**--**	**--**	**na**	**2.1E+03**
2,4,6-Trichlorophenol [C]	0	--	--	na	2.4E+01	--	--	na	1.7E+03	--	--	na	2.4E+00	--	--	na	1.7E+02	**--**	**--**	**na**	**1.7E+02**
2-(2,4,5-Trichlorophenoxy) propionic acid (Silvex)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Vinyl Chloride[C]	0	--	--	na	2.4E+01	--	--	na	1.7E+03	--	--	na	2.4E+00	--	--	na	1.7E+02	**--**	**--**	**na**	**1.7E+02**
Zinc	0	1.1E+02	4.9E+01	na	2.6E+04	1.2E+02	3.5E+02	na	5.0E+05	1.4E+01	1.2E+01	na	2.6E+03	6.5E+01	8.6E+01	na	5.0E+04	**6.5E+01**	**8.6E+01**	**na**	**5.0E+04**

Notes:

1. All concentrations expressed as micrograms/liter (ug/l), unless noted otherwise
2. Discharge flow is highest monthly average or Form 2C maximum for Industries and design flow for Municipals
3. Metals measured as Dissolved, unless specified otherwise
4. "C" indicates a carcinogenic parameter
5. Regular WLAs are mass balances (minus background concentration) using the % of stream flow entered above under Mixing Information.
   Antidegradation WLAs are based upon a complete mix.
6. Antideg. Baseline = (0.25(WQC - background conc.) + background conc.) for acute and chronic
   = (0.1(WQC - background conc.) + background conc.) for human health
7. WLAs established at the following stream flows: 1Q10 for Acute, 30Q10 for Chronic Ammonia, 7Q10 for Other Chronic, 30Q5 for Non-carcinogens and Harmonic Mean for Carcinogens. To apply mixing ratios from a model set the stream flow equal to (mixing ratio - 1), effluent flow equal to 1 and 100% mix.

Metal	Target Value (SSTV)
Antimony	1.2E+03
Arsenic	1.4E+02
Barium	na
Cadmium	5.3E-01
Chromium III	3.3E+01
Chromium VI	6.8E+00
Copper	2.8E+00
Iron	na
Lead	3.8E+00
Manganese	na
Mercury	6.0E-01
Nickel	8.9E+00
Selenium	5.3E+00
Silver	3.5E-01
Zinc	2.6E+01

Note: do not use QL's lower than the minimum QL's provided in agency guidance

Mixing Zone Predictions for Wilderness WWTP

Effluent Flow = 2.0 MGD
Stream 7Q10 = 12 MGD
Stream 30Q10 = 21.7 MGD
Stream 1Q10 = 7.6 MGD
Stream slope = .004 ft/ft
Stream width = 200 ft
Bottom scale = 4
Channel scale = 2

Mixing Zone Predictions @ 7Q10

Depth = .3347 ft
Length = 49696.21 ft
Velocity = .3238 ft/sec
Residence Time = 1.7766 days

Recommendation:

A complete mix assumption is appropriate for this situation and the entire 7Q10 may be used.

Mixing Zone Predictions @ 30Q10

Depth = .4592 ft
Length = 38148.15 ft
Velocity = .3994 ft/sec
Residence Time = 1.1054 days

Recommendation:

A complete mix assumption is appropriate for this situation and the entire 30Q10 may be used.

Mixing Zone Predictions @ 1Q10

Depth = .2668 ft
Length = 60053.98 ft
Velocity = .2785 ft/sec
Residence Time = 59.9026 hours

Recommendation:

A complete mix assumption is appropriate for this situation providing no more than 1.67% of the 1Q10 is used.

Virginia DEQ Mixing Zone Analysis Version 2.1

Mixing Zone Predictions for Wilderness WWTP

Effluent Flow = 2 MGD
Stream 7Q10 = 76 MGD
Stream 30Q10 = 102.3 MGD
Stream 1Q10 = 55.7 MGD
Stream slope = .004 ft/ft
Stream width = 200 ft
Bottom scale = 4
Channel scale = 2

Mixing Zone Predictions @ 7Q10

Depth = .9403 ft
Length = 20927.76 ft
Velocity = .642 ft/sec
Residence Time = .3773 days

Recommendation:

A complete mix assumption is appropriate for this situation and the entire 7Q10 may be used.

Mixing Zone Predictions @ 30Q10

Depth = 1.1202 ft
Length = 18065.68 ft
Velocity = .7207 ft/sec
Residence Time = .2901 days

Recommendation:

A complete mix assumption is appropriate for this situation and the entire 30Q10 may be used.

Mixing Zone Predictions @ 1Q10

Depth = .7842 ft
Length = 24370.09 ft
Velocity = .5695 ft/sec
Residence Time = 11.8876 hours

Recommendation:

A complete mix assumption is appropriate for this situation providing no more than 8.41% of the 1Q10 is used.

Virginia DEQ Mixing Zone Analysis Version 2.1

3/29/2011 10:00:58 AM

Facility = Wilderness WWTP
Chemical = Ammonia 0.715 MGD summer
Chronic averaging period = 30
WLAa = 22
WLAc = 16
Q.L. = .2
# samples/mo. = 12
# samples/wk. = 3

Summary of Statistics:

observations = 1
Expected Value = 9
Variance = 29.16
C.V. = 0.6
97th percentile daily values = 21.9007
97th percentile 4 day average = 14.9741
97th percentile 30 day average= 10.8544
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

9

3/29/2011 10:01:30 AM

Facility = Wilderness WWTP
Chemical = Ammonia 0.715 MGD winter
Chronic averaging period = 30
WLAa = 87
WLAc = 50
Q.L. = .2
# samples/mo. = 12
# samples/wk. = 3

Summary of Statistics:

observations = 1
Expected Value = 9
Variance = 29.16
C.V. = 0.6
97th percentile daily values = 21.9007
97th percentile 4 day average = 14.9741
97th percentile 30 day average= 10.8544
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

9

3/29/2011 10:02:51 AM

Facility = Wilderness WWTP
Chemical = Ammonia 2.0 MGD summer
Chronic averaging period = 30
WLAa = 15
WLAc = 6.3
Q.L. = .2
# samples/mo. = 20
# samples/wk. = 5

Summary of Statistics:

observations = 1
Expected Value = 9
Variance = 29.16
C.V. = 0.6
97th percentile daily values = 21.9007
97th percentile 4 day average = 14.9741
97th percentile 30 day average= 10.8544
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity
Maximum Daily Limit = 12.7113215885228
Average Weekly limit = 8.28470960032217
Average Monthly LImit = 6.54190413015236

The data are:

9

3/29/2011 10:03:10 AM

Facility = Wilderness WWTP
Chemical = Ammonia 2.0 MGD winter
Chronic averaging period = 30
WLAa = 45
WLAc = 18
Q.L. = .2
# samples/mo. = 20
# samples/wk. = 5

Summary of Statistics:

observations = 1
Expected Value = 9
Variance = 29.16
C.V. = 0.6
97th percentile daily values = 21.9007
97th percentile 4 day average = 14.9741
97th percentile 30 day average= 10.8544
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

9

3/29/2011 10:05:06 AM

Facility = Wilderness WWTP
Chemical = Total Residual Chlorine 0.715 MGD
Chronic averaging period = 4
WLAa = 22
WLAc = 49
Q.L. = 100
# samples/mo. = 90
# samples/wk. = 23

Summary of Statistics:

observations = 1
Expected Value = 200
Variance = 14400
C.V. = 0.6
97th percentile daily values = 486.683
97th percentile 4 day average = 332.758
97th percentile 30 day average= 241.210
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Acute Toxicity
Maximum Daily Limit = 22
Average Weekly limit = 11.3406834286176
Average Monthly LImit = 10.1163188089696

The data are:

200

3/29/2011 10:06:05 AM

Facility = Wilderness WWTP
Chemical = Total Residual Chlorine 2.0 MGD
Chronic averaging period = 4
WLAa = 20
WLAc = 19
Q.L. = 100
# samples/mo. = 120
# samples/wk. = 30

Summary of Statistics:

observations = 1
Expected Value = 200
Variance = 14400
C.V. = 0.6
97th percentile daily values = 486.683
97th percentile 4 day average = 332.758
97th percentile 30 day average= 241.210
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Acute Toxicity
Maximum Daily Limit = 20
Average Weekly limit = 10.033308239793
Average Monthly LImit = 9.06565849498694

The data are:

200

3/29/2011 2:59:41 PM

Facility = Wilderness WWTP
Chemical = Total Recoverable Copper 0.715 MGD
Chronic averaging period = 4
WLAa = 8.2
WLAc = 13
Q.L. = 1.0
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 14
Expected Value = 3.01629
Variance = 1.66697
C.V. = 0.428046
97th percentile daily values = 5.99811
97th percentile 4 day average = 4.39169
97th percentile 30 day average= 3.45969
< Q.L. = 0
Model used = lognormal

No Limit is required for this material

The data are:

2.8
4.4
1.6
1.6
2.3
2.2
4.5
2
4.7
2.7
2.7
2.3
6
2.34

3/29/2011 3:02:06 PM

Facility = Wilderness WWTP
Chemical = Total Recoverable Zinc 0.715 MGD
Chronic averaging period = 4
WLAa = 76
WLAc = 170
Q.L. = 5
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 14
Expected Value = 45.1599
Variance = 149.760
C.V. = 0.270984
97th percentile daily values = 71.9160
97th percentile 4 day average = 57.6746
97th percentile 30 day average= 49.3626
< Q.L. = 0
Model used = lognormal

No Limit is required for this material

The data are:

43
36
46
46
22
53
53
39
41
53
58
58
49
31.6

VA0083411 Copper STATS with new THard Jul 2011

7/7/2011 1:00:36 PM

Facility = Wilderness WWTP
Chemical = Total Recoverable Copper 2.0 MaD
Chronic averaging period = 4
WLAa = 6.9
WLAc = 6.5
Q.L. = 2
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 14
Expected Value = 3.07211
Variance = 1.49756
C.V. = 0.398340
97th percentile daily values = 6.06105
97th percentile 4 day average = 4.36612
97th percentile 30 day average= 3.49238
< Q.L. = 2
Model used = delta lognormal

No Limit is required for this material

The data are:

2.8
4.4
1.6
1.6
2.3
2.2
4.5
2
4.7
2.7
2.7
2.3
6
2.34

VA0083411 Zinc STATS with new THard Jul 2011

7/7/2011 1:01:57 PM

Facility = Wilderness WWTP
Chemical = Total Recoverable Zinc 2.0 MGD
Chronic averaging period = 4
WLAa = 65
WLAc = 86
Q.L. = 5
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 14
Expected Value = 45.1599
Variance = 149.760
C.V. = 0.270984
97th percentile daily values = 71.9160
97th percentile 4 day average = 57.6746
97th percentile 30 day average= 49.3626
< Q.L. = 0
Model used = lognormal

A limit is needed based on Acute Toxicity
Maximum Daily Limit = 65
Average Weekly limit = 65
Average Monthly LImit = 65

The data are:

43
36
46
46
22
53
53
39
41
53
58
58
49
31.6

EXECUTIVE SUMMARY

In 1990 Gilbert W. Clifford & Associates prepared a mathematical dissolved oxygen model of the lower reach of the Rapidan River using "Monte Carlo" simulation techniques. The model was prepared in support of the application by the Rapidan Service Authority for a permit to discharge treated wastewater from the Wilderness wastewater treatment facility.

The Wilderness VPDES discharge permit expires in 1990 and the Virginia Department of Environmental Quality (DEQ) requested an updating of the water quality model as a part of its permit reissuance process. In addition the treatment facilities have been rerated from a design flow of 0.500 million gallons per day (MGD) to 0.715 MGD, and the Rapidan Service Authority has requested the evaluation of an additional discharge tier at 1.125 MGD.

For the new modeling effort the Consultants used the basic elements of the 1990 model. The only adjustments were the incorporation of updated critical streamflow values provided by the DEQ technical staff, the elimination of the now abandoned Lake of the Woods wastewater treatment plant discharge loading, and the addition of the surface water withdrawal permit for the Wilderness water treatment plant. All other constants, statistical assumptions and hydrophysical characteristics remained unchanged.

The model was run for 1000 trials at two stream flow tiers. Each Streamflow tier was simulated at a discharge tier of 0.715 and 1.125 MGD. Based on the model projections, the Consultants recommend the following discharge permit limits:

Low Streamflow Tier (June to November)

	Carbonaceous BOD_5 mg/l, monthly average	Total Kjeldahl Nitrogen mg/l, monthly average
0.715 MGD	14	3
1.125 MGD	14	3

High Streamflow Tier (December to May)

	Carbonaceous BOD_5 mg/l, monthly average	Total Kjeldahl Nitrogen mg/l, monthly average
0.715 MGD	24	7
1.125 MGD	24	7

The modeling effort indicated that more lenient limits were possible under some conditions. However in those cases the existing discharge limits were deemed to govern.

PHYSICAL CHARACTERISTICS OF THE RAPIDAN RIVER

Table 1 shows the measured and calculated physical data for the Rapidan River in the study area. The data were extracted from the U. S. G. S. maps covering the study area and the time of passage measurements from the field data.

The Department of Environmental Quality technical staff has the responsibility for collecting and analyzing stream flow data to determine critical low flow conditions (The minimum mean seven consecutive day flow with a ten year recurrence frequency). The nearest gaging station to the study area is the "Rapidan River near Culpeper". The station, which measures flow from a drainage area of 472 sq mi, is 17.5 miles above the Wilderness discharge at the U. S. Route 522 bridge. Records have been kept since 1931 and the quality of the streamflow data is very good. The critical drought flow value (7Q10) at the gage is approximately 20.8 cfs[1] (0.044 cfs/sq mi).

Based on physical observations and the U. S. G. S. topographic maps, it is possible to calculate the principal hydrographic factors of the stream bed given a fixed cross section geometry. Although these calculations are theoretical, they predict measured physical parameters with reasonable accuracy. The calculations for the determination of the hydraulic radius, Manning roughness coefficient, and depths of flow for various assumed cross sections under drought flow conditions are shown in Appendix B. Table 1 summarizes the physical values selected as a result of this analysis.

Table 1
RAPIDAN RIVER WATER QUALITY MODEL
PHYSICAL CHARACTERISTICS

STATION	Distance (ft)	Length (ft)	ΔH (ft)	Slope (ft/100 ft)	Flow Velocity (ft/sec)	Passage (days)	Drainage Area (sq. mi.)	Flow (cfs)
Wilderness discharge							640	28.2
		4800	3	0.062	0.25	0.1		
Flat Run	4800						662	29.2
		2400	2	0.083	0.25	0.1		
170	7200							
		14300	10	0.070	0.25	0.7		
160	21500							
		12900	10	0.078	0.25	0.6		
150	34400						685	30.2
		7300	10	0.137	0.35	0.2		
140	41700							
		7100	10	0.141	0.35	0.2		
130	48800						692	30.5
		2800	10	0.357	0.50	0.1		
120	51600						693	30.5
TOTAL		9.7 miles				2.1 days		

The flow values were calculated by multiplying the drainage area by 0.044.

1. Memorandum dated December 28, 1999 from Paul E. Herman, P. E. to James Engbert, DEQ, NRO.

EXISTING WASTEWATER TREATMENT FACILITIES

The only major wastewater discharge in the study area is the Wilderness Wastewater Treatment Facility owned and operated by the Rapidan Service Authority. The plant was designed to treat an average wastewater flow of 500,000 GPD (expandible to 997,000 GPD). The Wilderness plant currently has the following discharge permit limits.

Permit No. VA0083411

pH Range	6.0 to 9.0	
Maximum Effluent $CBOD_5$ Concentration		
Low Streamflow Tier (June to November)	14 mg/l, monthly avg.	21 mg/l, weekly avg
High Streamflow Tier (December to May)	24 mg/l, monthly avg.	36 mg/l, weekly avg
Maximum Suspended Solids Concentration	30 mg/l, monthly avg.	45 mg/l, weekly avg.
Maximum Effluent TKN Concentration		
Low Streamflow Tier (June to November)	3 mg/l, monthly avg.	4.5 mg/l, weekly avg
High Streamflow Tier (December to May)	7 mg/l, monthly avg.	10.5 mg/l, weekly avg
Dissolved Oxygen Concentration	6.5 mg/l, minimum	

Disinfection and dechlorination of the treated effluent are also required

Operating records indicate that the Wilderness plant is performing well within the limits of its current VPDES permit.

Recent Discharge Monitoring Reports show the following:

MONTH	FLOW (MGD)	CBOD5 (mg/l)	SUSPENDED SOLIDS (mg/l)	TKN (mg/l)	DISSOLVED OXYGEN (mg/l)
April, 2000	0.590	2.8	1.8	1.13	7.4
May	0.446	2.1	1.1	0.82	6.2
June	0.479	1.6	1.7	0.58	6.6

SOURCE: Rapidan Service Authority

In 1999, based on an analysis of the treatment units, the facility was rerated to an average wastewater treatment capacity of 715,000 GPD.[2] The discharge permit limits were not revised at the time of rerating.

Additional analysis by the Service Authority technical staff indicates that the Wilderness plant capacity can be increased to 1,125,000 GPD with relatively minor physical modification to the treatment works.

For the purposes of this modelling exercise permit limits were evaluated for wastewater flows of both 715,000 and 1,125,000 GPD.

There are no other significant point sources of contaminants in the study reach.

2. Report dated February 24, 1999 prepared by the Rapidan Service Authority and letter dated June 15, 1999 from C. M. Sawyer, P. E. , SDH, DWE to Gregory Clayton DEQ, NRO

Because of the large increase in streambed slope (and the corresponding increase in flow velocity and reaeration rates), the calculated flow velocities vary widely and become progressively greater in the downstream direction. Because of this significant variation it was necessary to segment the model for flow velocity. In order to facilitate comparison with previous modelling work, the segment between the discharge and Flat Run was also retained.

The water quality model divides the Rapidan into four independent reaches. (Refer to Figure 2.) In general, each reach is bounded by the location of a ten foot contour crossing of the river.

Each reach was broken into equal increments of 0.3 miles in length and each segment length was rounded to the nearest 0.3 miles. The drought flow values in each reach were adjusted downward by 3.1 cfs to acccount for the Wilderness water withdrawal. Table 3 summarizes the stream reach characteristics:

Table 3
RAPIDAN RIVER WATER QUALITY MODEL
STREAM REACH CHARACTERISTICS

Reach	Description	Length (mi)	Segments	Flow (cfs)
1	Discharge to Confluence with Flat Run	0.90	3	25.1
2	Flat Run to elevation 150	5.60	19	26.1
3	Elevation 150 to elevation 130	2.72	9	27.1
4	Elevation 130 to Confluence with Rappahannock	0.53	2	27.4
	TOTAL	*9.77*	*33*	

Initial dissolved oxygen and oxygen demand concentrations at the beginning of each segment were computed using a mass balance formula. The projected dissolved oxygen concentration for each stream segment was then computed for each 0.3 mile increment. The oxygen demand concentration was computed for the end of each stream reach and along with the dissolved oxygen concentration became the initial values for the succeeding reach.

Once the constants and equations for the water quality model were established, the model was entered into a computer spreadsheet for initial solution (Microsoft Excel™ for the Apple Macintosh). The spreadsheet was then loaded into a forecasting and risk assessment program (Crystal Ball™) for the "Monte Carlo" simulation.

Experience has shown that 500 trials are more than sufficient to produce a consistent result in the Monte Carlo simulation. For the Rapidan River Water Quality Model, 1000 trials were used.

The formula and cell references for the spreadsheet model are shown in Appendix A.

MODELING OF TIERED PERMIT EFFLUENT REQUIREMENTS

Tiered permits issued by the Virginia Department of Environmental Quality may allow a lower level of treatment during periods of wet and cool weather. Higher streamflows and lower temperatures both significantly increase the assimilation capacity and decrease the sensitivity to non-persistent toxicity of receiving streams. The effluent characteristics affected by seasonal factors are ammonia and oxygen demand and only two tiers are permitted.

The first step in developing a tiered permit is the determination of a critical low flow for the wet season. As a part of the previous modeling effort the wet weather season was determined by averaging all the monthly average values to create an annual average value. The individual monthly averages were then divided by the annual average and those with a value greater than one were deemed to be the wet weather months. The analysis showed that the wet season is from December to May for the gaging station "Rapidan River near Culpeper".

A recent analysis of the streamflow data by the DEQ technical staff has established the wet season (high flow) 7Q10 value as 103 cfs.[8] Based on this analysis, the wet season unit low flow value is 0.218 cfs per square mile.

Table 6 shows the physical stream characteristics used in modeling the wet season assimilation capacity. The available dilution flow at the point of discharge was increased by approximately 400 percent. compared to the year round critical low flow value.

Table 6
RAPIDAN RIVER WATER QUALITY MODEL
WET SEASON PHYSICAL CHARACTERISTICS

STATION	Distance (ft)	Length (ft)	ΔH (ft)	Slope (ft/100 ft)	Flow Velocity (ft/sec)	Passage (days)	Drainage Area (sq. mi.)	Flow (cfs)
Wilderness discharge							650	138.7
		4800	3	0.062	0.25	0.1		
Flat Run	4800						662	141.4
		2400	2	0.083	0.25	0.1		
170	7200							
		14300	10	0.070	0.25	0.7		
160	21500							
		12900	10	0.078	0.25	0.6		
150	34400						685	146.4
		7300	10	0.137	0.35	0.2		
140	41700							
		7100	10	0.141	0.35	0.2		
130	48800						692	147.9
		2800	10	0.357	0.50	0.1		
120	51600						693	148.0
TOTAL		9.7 miles				2.1 days		

The flow values were calculated by multiplying the drainage area by 0.218 and adjusting downward by 3.1 cfs to account for water supply withdrawals..

9. December 28, 1999 memorandum from Paul E. Herman, op. cit.

Memorandum

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Office of Water Permits Support — 9th Floor, 629 East Main Street, Richmond, VA

SUBJECT: "Rapidan River Water Quality Model, Revision 4.0", Gilbert W. Clifford & Associates, Inc., July, 2000

TO: Golnaz H. Walker - NVRO

FROM: Jon van Soestbergen, P.E.

DATE: August 21, 2000

COPIES: Tom Faha - NVRO

I have reviewed the subject report. The model predicts that the dissolved oxygen water quality standards will be maintained at the proposed effluent limits. The assumptions made for the modeling appear reasonable and are consistent with those presented in the January 1990 report "Rapidan River Water Quality Model, Revision 3.0", which you also provided. Provided the assumptions made reasonably reflect conditions in the field, the model should provide an adequate basis for determining wasteload allocations. I have the following observations/comments:

1. The model presented is not a calibrated and verified model. The conclusions made based on the model are therefore only as valid as the assumptions made during model input.

   DEQ has developed a standard dissolved oxygen model (Regional Model 3.2) that is routinely applied by DEQ staff in applicable situations where an appropriate calibrated and verified stream model will not be developed. Although less than ideal, use of this standard model does ensure consistency in assumptions and methodology where the model is not calibrated to field conditions. Where use of DEQ's Regional Model is appropriate, the results from uncalibrated/unverified dissolved oxygen models submitted by permittees or their consultants should be consistent with its results. Therefore, to determine whether there is consistency between the conclusions presented in the subject report and predictions from DEQ's Regional Model 3.2, I ran the DEQ model using inputs drawn from the report. The results from the Regional Model give rise to the same conclusion as presented in the report; the dissolved oxygen standards will not be violated under the proposed loading condition.

2. To establish the baseline condition, a BOD_{ult}/BOD_5 ratio of 3.0 was used for the Lake of the Woods discharge. This was not explained in the consultant report but is a reasonable assumption given a BOD_5 limit of 30.0 mg/l and no TKN limit.

3. The report states "non-degradation would occur when the proposed discharge depleted the dissolved oxygen in the critical stream segment by 0.2 mg/l or less when compared with existing conditions." (Report, p.14). Although this is true, anti-degradation should be evaluated for all modeled segments. To satisfy anti-degradation requirements, there can be no more than 0.2 mg/l drop in dissolved oxygen from baseline conditions *anywhere* along the modeled portion of the stream, not just in the critical segment. The model as submitted predicts that anti-degradation requirements are satisfied.

If you have any questions or require additional information, please do not hesitate to contact me at (804) 698-4117.

1.25

REGIONAL MODELING SYSTEM VERSION 4.0
Model Input File for the Discharge to RAPIDAN RIVER.

File Information

File Name:	I:\althompson\Permit Documents\PERMITS IN PROGRESS\Wilderness S
Date Modified:	April 06, 2006

Water Quality Standards Information

Stream Name:	RAPIDAN RIVER
River Basin:	Rappahannock River Basin
Section:	4
Class:	III - Nontidal Waters (Coastal and Piedmont)
Special Standards:	none

Background Flow Information

Gauge Used:	01667500
Gauge Drainage Area:	472 Sq.Mi.
Gauge 7Q10 Flow:	13.4 MGD
Headwater Drainage Area:	640 Sq.Mi.
Headwater 7Q10 Flow:	16.169 MGD (Net; includes Withdrawals/Discharges)
Withdrawal/Discharges:	-2 MGD
Incremental Flow in Segments:	2.838983E-02 MGD/Sq.Mi.

Background Water Quality

Background Temperature:	22 Degrees C
Background cBOD5:	2 mg/l
Background TKN:	0 mg/l
Background D.O.:	7.845246 mg/l

Model Segmentation

Number of Segments:	4
Model Start Elevation:	175 ft above MSL
Model End Elevation:	120 ft above MSL

REGIONAL MODELING SYSTEM VERSION 4.0

Model Input File for the Discharge to RAPIDAN RIVER.

Segment Information for Segment 1

Definition Information

Segment Definition:	A discharge enters.
Discharge Name:	WILDERNESS WWTP
VPDES Permit No.:	

Discharger Flow Information

Flow:	1.25 MGD
cBOD5:	12 mg/l
TKN:	3 mg/l
D.O.:	6.5 mg/l
Temperature:	22 Degrees C

Geographic Information

Segment Length:	0.9 miles
Upstream Drainage Area:	640 Sq.Mi.
Downstream Drainage Area:	662 Sq.Mi.
Upstream Elevation:	175 Ft.
Downstream Elevation:	172 Ft.

Hydraulic Information

Segment Width:	290 Ft.
Segment Depth:	0.65 Ft.
Segment Velocity:	0.155 Ft./Sec.
Segment Flow:	17.419 MGD
Incremental Flow:	0.625 MGD (Applied at end of segment.)

Channel Information

Cross Section:	Rectangular
Character:	Mostly Straight
Pool and Riffle:	Yes
Percent Pools:	50
Percent Riffles:	50
Pool Depth:	0.8 Ft.
Riffle Depth:	0.5 Ft.
Bottom Type:	Large Rock
Sludge:	None
Plants:	Few
Algae:	None

REGIONAL MODELING SYSTEM VERSION 4.0
Model Input File for the Discharge to RAPIDAN RIVER.

Segment Information for Segment 2

Definition Information

Segment Definition:	A tributary enters.
Tributary Name:	FLAT RUN

Tributary Flow Information

Flow:	0.6463 MGD
cBOD5:	2 mg/l
TKN:	0 mg/l
D.O.:	7.846 mg/l
Temperature:	22 Degrees C

Geographic Information

Segment Length:	5.6 miles
Upstream Drainage Area:	662 Sq.Mi.
Downstream Drainage Area:	685 Sq.Mi.
Upstream Elevation:	172 Ft.
Downstream Elevation:	150 Ft.

Hydraulic Information

Segment Width:	190 Ft.
Segment Depth:	0.652 Ft.
Segment Velocity:	0.169 Ft./Sec.
Segment Flow:	18.065 MGD
Incremental Flow:	0.653 MGD (Applied at end of segment.)

Channel Information

Cross Section:	Rectangular
Character:	Mostly Straight
Pool and Riffle:	No
Bottom Type:	Large Rock
Sludge:	None
Plants:	Few
Algae:	None

REGIONAL MODELING SYSTEM VERSION 4.0
Model Input File for the Discharge to RAPIDAN RIVER.

Segment Information for Segment 3

Definition Information

Segment Definition:	A significant change occurs.

Geographic Information

Segment Length:	2.72 miles
Upstream Drainage Area:	685 Sq.Mi.
Downstream Drainage Area:	692 Sq.Mi.
Upstream Elevation:	150 Ft.
Downstream Elevation:	130 Ft.

Hydraulic Information

Segment Width:	149.999 Ft.
Segment Depth:	0.658 Ft.
Segment Velocity:	0.209 Ft./Sec.
Segment Flow:	18.065 MGD
Incremental Flow:	0.199 MGD (Applied at end of segment.)

Channel Information

Cross Section:	Rectangular
Character:	Moderately Meandering
Pool and Riffle:	Yes
Percent Pools:	50
Percent Riffles:	50
Pool Depth:	1 Ft.
Riffle Depth:	0.35 Ft.
Bottom Type:	Large Rock
Sludge:	None
Plants:	Few
Algae:	None

REGIONAL MODELING SYSTEM VERSION 4.0

Model Input File for the Discharge to RAPIDAN RIVER.

Segment Information for Segment 4

Definition Information

Segment Definition:	A tributary enters.
Tributary Name:	UT RAPIDAN RIVER

Tributary Flow Information

Flow:	0.4 MGD
cBOD5:	2 mg/l
TKN:	0 mg/l
D.O.:	7.858 mg/l
Temperature:	22 Degrees C

Geographic Information

Segment Length:	0.53 miles
Upstream Drainage Area:	692 Sq.Mi.
Downstream Drainage Area:	693 Sq.Mi.
Upstream Elevation:	130 Ft.
Downstream Elevation:	120 Ft.

Hydraulic Information

Segment Width:	150 Ft.
Segment Depth:	0.509 Ft.
Segment Velocity:	0.268 Ft./Sec.
Segment Flow:	18.465 MGD
Incremental Flow:	0.028 MGD (Applied at end of segment.)

Channel Information

Cross Section:	Rectangular
Character:	Mostly Straight
Pool and Riffle:	No
Bottom Type:	Large Rock
Sludge:	None
Plants:	Light
Algae:	None

"Model Run For I:\althompson\Permit Documents\PERMITS IN PROGRESS\Wilderness STP\2006 Reissuance\Wilderness_125_12_3_65udate_flow.mod On 4/6/2006 7:02:44 AM"

"Model is for RAPIDAN RIVER."
"Model starts at the WILDERNESS WWTP discharge."

"Background Data"

"7Q10"	"cBOD5"	"TKN"	"DO"	"Temp"
"(mgd)"	"(mg/l)"	"(mg/l)"	"(mg/l)"	"deg C"
16.169,	2,	0,	7.845,	22

"Discharge/Tributary Input Data for Segment 1"

"Flow"	"cBOD5"	"TKN"	"DO"	"Temp"
"(mgd)"	"(mg/l)"	"(mg/l)"	"(mg/l)"	"deg C"
1.25,	12,	3,	,6.5,	22

"Hydraulic Information for Segment 1"

"Length"	"Width"	"Depth"	"Velocity"
"(mi)"	"(ft)"	"(ft)"	"(ft/sec)"
.9,	290,	.65,	.155

"Initial Mix Values for Segment 1"

"Flow"	"DO"	"cBOD"	"nBOD"	"DOSat"	"Temp"
"(mgd)"	"(mg/l)"	"(mg/l)"	"(mg/l)"	"(mg/l)"	"deg C"
17.419,	7.749,	6.794,	0,	8.717,	22

"Rate Constants for Segment 1. - (All units Per Day)"

"k1",	"k1@T",	"k2",	"k2@T",	"kn",	"kn@T",	"BD",	"BD@T"
.3,	.329,	2,	2.097,	.15,	.175,	0,	0

"Output for Segment 1"
"Segment starts at WILDERNESS WWTP"

"Total" "Dist."	"Segm." "Dist."	"DO"	"cBOD"	"nBOD"
"(mi)"	"(mi)"	"(mg/l)"	"(mg/l)"	"(mg/l)"
0,	0,	7.749,	6.794,	0
.1,	.1,	7.742,	6.706,	0
.2,	.2,	7.736,	6.62,	0
.3,	.3,	7.732,	6.535,	0
.4,	.4,	7.729,	6.451,	0
.5,	.5,	7.728,	6.368,	0
.6,	.6,	7.728,	6.286,	0
.7,	.7,	7.729,	6.205,	0
.8,	.8,	7.731,	6.125,	0
.9,	.9,	7.734,	6.046,	0

"Discharge/Tributary Input Data for Segment 2"

"Flow"	"cBOD5"	"TKN"	"DO"	"Temp"
"(mgd)"	"(mg/l)"	"(mg/l)"	"(mg/l)"	"deg C"
.6463,	2,	0,	,7.846,	22

"Incremental Flow Input Data for Segment 2"

"Flow"	"cBOD5"	"TKN"	"DO"	"Temp"
"(mgd)"	"(mg/l)"	"(mg/l)"	"(mg/l)"	"deg C"
.625,	2,	0,	,7.849,	22

"Hydraulic Information for Segment 2"

"Length"	"Width"	"Depth"	"Velocity"
"(mi)"	"(ft)"	"(ft)"	"(ft/sec)"
5.6,	190,	.652,	.169

"Initial Mix Values for Segment 2"
"Flow", "DO", "cBOD", "nBOD", "DOSat", "Temp"
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"
18.6903, 7.742, 5.975, 0, 8.721, 22

"Rate Constants for Segment 2. - (All units Per Day)"
"k1", "k1@T", "k2", "k2@T", "kn", "kn@T", "BD", "BD@T"
.5, .548, 2.357, 2.472, .25, .292, 0, 0

"Output for Segment 2"
"Segment starts at FLAT RUN"
"Total", "Segm."
"Dist.", "Dist.", "DO", "cBOD", "nBOD"
"(mi)", "(mi)", "(mg/l)", "(mg/l)", "(mg/l)"
.9, 0, 7.742, 5.975, 0
1, .1, 7.714, 5.858, 0
1.1, .2, 7.69, 5.743, 0
1.2, .3, 7.67, 5.63, 0
1.3, .4, 7.654, 5.52, 0
1.4, .5, 7.642, 5.412, 0
1.5, .6, 7.633, 5.306, 0
1.6, .7, 7.626, 5.202, 0
1.7, .8, 7.622, 5.1, 0
1.8, .9, 7.62, 5, 0
1.9, 1, 7.714, 5, 0
2, 1.1, 7.8, 5, 0
2.1, 1.2, 7.849, 5, 0
2.2, 1.3, 7.849, 5, 0
2.3, 1.4, 7.849, 5, 0
2.4, 1.5, 7.849, 5, 0
2.5, 1.6, 7.849, 5, 0
2.6, 1.7, 7.849, 5, 0
2.7, 1.8, 7.849, 5, 0
2.8, 1.9, 7.849, 5, 0
2.9, 2, 7.849, 5, 0
3, 2.1, 7.849, 5, 0
3.1, 2.2, 7.849, 5, 0
3.2, 2.3, 7.849, 5, 0
3.3, 2.4, 7.849, 5, 0
3.4, 2.5, 7.849, 5, 0
3.5, 2.6, 7.849, 5, 0
3.6, 2.7, 7.849, 5, 0
3.7, 2.8, 7.849, 5, 0
3.8, 2.9, 7.849, 5, 0
3.9, 3, 7.849, 5, 0
4, 3.1, 7.849, 5, 0
4.1, 3.2, 7.849, 5, 0
4.2, 3.3, 7.849, 5, 0
4.3, 3.4, 7.849, 5, 0
4.4, 3.5, 7.849, 5, 0
4.5, 3.6, 7.849, 5, 0
4.6, 3.7, 7.849, 5, 0
4.7, 3.8, 7.849, 5, 0
4.8, 3.9, 7.849, 5, 0
4.9, 4, 7.849, 5, 0
5, 4.1, 7.849, 5, 0
5.1, 4.2, 7.849, 5, 0
5.2, 4.3, 7.849, 5, 0
5.3, 4.4, 7.849, 5, 0
5.4, 4.5, 7.849, 5, 0
5.5, 4.6, 7.849, 5, 0
5.6, 4.7, 7.849, 5, 0

```
5.7,     4.8,      7.849,    5,        0
5.8,     4.9,      7.849,    5,        0
5.9,     5,        7.849,    5,        0
6,       5.1,      7.849,    5,        0
6.1,     5.2,      7.849,    5,        0
6.2,     5.3,      7.849,    5,        0
6.3,     5.4,      7.849,    5,        0
6.4,     5.5,      7.849,    5,        0
6.5,     5.6,      7.849,    5,        0



"Discharge/Tributary Input Data for Segment 3"
"Flow",  "cBOD5",  "TKN",    "DO",     "Temp"
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"
0,       0,        0,        ,0,       0

"Incremental Flow Input Data for Segment 3"
"Flow",  "cBOD5",  "TKN",    "DO",     "Temp"
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"
.653,    2,        0,        ,7.855,   22

"Hydraulic Information for Segment 3"
"Length","Width",  "Depth",  "Velocity"
"(mi)",  "(ft)",   "(ft)",   "(ft/sec)"
2.72,    149.999,  .658,     .209

"Initial Mix Values for Segment 3"
"Flow",  "DO",     "cBOD",   "nBOD",   "DOSat",  "Temp"
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"
19.3433, 7.849,    5,        0,        8.728,    22

"Rate Constants for Segment 3. - (All units Per Day)"
"k1",  "k1@T", "k2",   "k2@T", "kn",   "kn@T", "BD",   "BD@T"
.3,    .329,   4.412,  4.626,  .15,    .175,   0,      0

"Output for Segment 3"
"Segment starts at "
"Total", "Segm."
"Dist.", "Dist.",  "DO",     "cBOD",   "nBOD"
"(mi)",  "(mi)",   "(mg/l)", "(mg/l)", "(mg/l)"
6.5,     0,        7.849,    5,        0
6.6,     .1,       7.855,    5,        0
6.7,     .2,       7.855,    5,        0
6.8,     .3,       7.855,    5,        0
6.9,     .4,       7.855,    5,        0
7,       .5,       7.855,    5,        0
7.1,     .6,       7.855,    5,        0
7.2,     .7,       7.855,    5,        0
7.3,     .8,       7.855,    5,        0
7.4,     .9,       7.855,    5,        0
7.5,     1,        7.855,    5,        0
7.6,     1.1,      7.855,    5,        0
7.7,     1.2,      7.855,    5,        0
7.8,     1.3,      7.855,    5,        0
7.9,     1.4,      7.855,    5,        0
8,       1.5,      7.855,    5,        0
8.1,     1.6,      7.855,    5,        0
8.2,     1.7,      7.855,    5,        0
8.3,     1.8,      7.855,    5,        0
8.4,     1.9,      7.855,    5,        0
8.5,     2,        7.855,    5,        0
```

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8.6,      2.1,      7.855,    5,        0
8.7,      2.2,      7.855,    5,        0
8.8,      2.3,      7.855,    5,        0
8.9,      2.4,      7.855,    5,        0
9,        2.5,      7.855,    5,        0
9.1,      2.6,      7.855,    5,        0
9.2,      2.7,      7.855,    5,        0
9.22,     2.72,     7.855,    5,        0



"Discharge/Tributary Input Data for Segment 4"
"Flow",   "cBOD5",  "TKN",    "DO",     "Temp"
"(mgd)",  "(mg/l)", "(mg/l)", "(mg/l)", "deg C"
.4,       2,        0,        ,7.858,   22

"Incremental Flow Input Data for Segment 4"
"Flow",   "cBOD5",  "TKN",    "DO",     "Temp"
"(mgd)",  "(mg/l)", "(mg/l)", "(mg/l)", "deg C"
.199,     2,        0,        ,7.859,   22

"Hydraulic Information for Segment 4"
"Length","Width",   "Depth",  "Velocity"
"(mi)",   "(ft)",   "(ft)",   "(ft/sec)"
.53,      150,      .509,     .268

"Initial Mix Values for Segment 4"
"Flow",   "DO",     "cBOD",   "nBOD",   "DOSat",  "Temp"
"(mgd)",  "(mg/l)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"
19.9423,  7.855,    5,        0,        8.732,    22

"Rate Constants for Segment 4. - (All units Per Day)"
"k1",   "k1@T", "k2",    "k2@T", "kn",   "kn@T", "BD",   "BD@T"
.5,     .548,   11.321,  11.871, .25,    .292,   0,      0

"Output for Segment 4"
"Segment starts at UT RAPIDAN RIVER"
"Total",  "Segm."
"Dist.",  "Dist.",  "DO",     "cBOD",   "nBOD"
"(mi)",   "(mi)",   "(mg/l)", "(mg/l)", "(mg/l)"
9.22,     0,        7.855,    5,        0
9.32,     .1,       7.859,    5,        0
9.42,     .2,       7.859,    5,        0
9.52,     .3,       7.859,    5,        0
9.62,     .4,       7.859,    5,        0
9.72,     .5,       7.859,    5,        0
9.75,     .53,      7.859,    5,        0



"END OF FILE"
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"***SEASONAL RUN***"
"Wet Season is from December to May."
"Model Run For I:\althompson\Permit Documents\PERMITS IN PROGRESS\Wilderness
STP\2006 Reissuance\Wilderness_125_12_3_65udate_flow.mod On 4/6/2006 8:48:07 AM"

"Model is for RAPIDAN RIVER."
"Model starts at the WILDERNESS WWTP discharge."

"Background Data"
"7Q10",   "cBOD5",   "TKN",     "DO",      "Temp"
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"
90.3051, 2,         0,         8.999,     15

"Discharge/Tributary Input Data for Segment 1"
"Flow",   "cBOD5",   "TKN",     "DO",      "Temp"
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"
1.25,     24,        7,         ,6.5,      17

"Hydraulic Information for Segment 1"
"Length","Width",   "Depth",   "Velocity"
"(mi)",   "(ft)",    "(ft)",    "(ft/sec)"
.9,       290,       2.108668,  .2316552

"Initial Mix Values for Segment 1"
"Flow",   "DO",      "cBOD",    "nBOD",    "DOSat",   "Temp"
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"
91.5551, 8.965,     5.751,     .236,      9.994,     15.02731

"Rate Constants for Segment 1. - (All units Per Day)"
"k1",   "k1@T", "k2",    "k2@T", "kn",   "kn@T", "BD",   "BD@T"
.3,     .239,   2,       1.778,  .15,    .102,   0,      0

"Output for Segment 1"
"Segment starts at WILDERNESS WWTP"
"Total", "Segm."
"Dist.", "Dist.",   "DO",      "cBOD",    "nBOD"
"(mi)",   "(mi)",    "(mg/l)", "(mg/l)", "(mg/l)"
0,        0,         8.965,     5.751,     .236
.1,       .1,        8.976,     5.715,     .235
.2,       .2,        8.987,     5.679,     .234
.3,       .3,        8.994,     5.643,     .233
.4,       .4,        8.994,     5.608,     .232
.5,       .5,        8.994,     5.573,     .231
.6,       .6,        8.994,     5.538,     .23
.7,       .7,        8.994,     5.503,     .229
.8,       .8,        8.994,     5.468,     .228
.9,       .9,        8.994,     5.434,     .227



"Discharge/Tributary Input Data for Segment 2"
"Flow",   "cBOD5",   "TKN",     "DO",      "Temp"
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"
3.6096,   2,         0,         ,9.004,    15

"Incremental Flow Input Data for Segment 2"
"Flow",   "cBOD5",   "TKN",     "DO",      "Temp"
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"
3.490672,2,         0,         ,8.999,    15

"Hydraulic Information for Segment 2"
"Length","Width",   "Depth",   "Velocity"
```

"(mi)", "(ft)", "(ft)", "(ft/sec)"
5.6, 190, .652, .169

"Initial Mix Values for Segment 2"
"Flow", "DO", "cBOD", "nBOD", "DOSat", "Temp"
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"
98.6554, 8.995, 5.403, .211, 9.999, 15.02534

"Rate Constants for Segment 2. - (All units Per Day)"
"k1", "k1@T", "k2", "k2@T", "kn", "kn@T", "BD", "BD@T"
.5, .398, 2.357, 2.095, .25, .17, 0, 0

"Output for Segment 2"
"Segment starts at FLAT RUN"
"Total", "Segm."
"Dist.", "Dist.", "DO", "cBOD", "nBOD"
"(mi)", "(mi)", "(mg/l)", "(mg/l)", "(mg/l)"
.9, 0, 8.995, 5.403, .211
1, .1, 8.993, 5.326, .21
1.1, .2, 8.992, 5.25, .209
1.2, .3, 8.992, 5.175, .208
1.3, .4, 8.993, 5.101, .207
1.4, .5, 8.995, 5.028, .206
1.5, .6, 8.998, 5, .205
1.6, .7, 8.999, 5, .204
1.7, .8, 8.999, 5, .203
1.8, .9, 8.999, 5, .202
1.9, 1, 8.999, 5, .201
2, 1.1, 8.999, 5, .2
2.1, 1.2, 8.999, 5, .199
2.2, 1.3, 8.999, 5, .198
2.3, 1.4, 8.999, 5, .197
2.4, 1.5, 8.999, 5, .196
2.5, 1.6, 8.999, 5, .195
2.6, 1.7, 8.999, 5, .194
2.7, 1.8, 8.999, 5, .193
2.8, 1.9, 8.999, 5, .192
2.9, 2, 8.999, 5, .191
3, 2.1, 8.999, 5, .19
3.1, 2.2, 8.999, 5, .189
3.2, 2.3, 8.999, 5, .188
3.3, 2.4, 8.999, 5, .187
3.4, 2.5, 8.999, 5, .186
3.5, 2.6, 8.999, 5, .185
3.6, 2.7, 8.999, 5, .184
3.7, 2.8, 8.999, 5, .183
3.8, 2.9, 8.999, 5, .182
3.9, 3, 8.999, 5, .181
4, 3.1, 8.999, 5, .18
4.1, 3.2, 8.999, 5, .179
4.2, 3.3, 8.999, 5, .178
4.3, 3.4, 8.999, 5, .177
4.4, 3.5, 8.999, 5, .176
4.5, 3.6, 8.999, 5, .175
4.6, 3.7, 8.999, 5, .174
4.7, 3.8, 8.999, 5, .173
4.8, 3.9, 8.999, 5, .172
4.9, 4, 8.999, 5, .171
5, 4.1, 8.999, 5, .17
5.1, 4.2, 8.999, 5, .169
5.2, 4.3, 8.999, 5, .168
5.3, 4.4, 8.999, 5, .167
5.4, 4.5, 8.999, 5, .166

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5.5,      4.6,      8.999,    5,        .165
5.6,      4.7,      8.999,    5,        .164
5.7,      4.8,      8.999,    5,        .163
5.8,      4.9,      8.999,    5,        .162
5.9,      5,        8.999,    5,        .161
6,        5.1,      8.999,    5,        .16
6.1,      5.2,      8.999,    5,        .159
6.2,      5.3,      8.999,    5,        .158
6.3,      5.4,      8.999,    5,        .157
6.4,      5.5,      8.999,    5,        .156
6.5,      5.6,      8.999,    5,        .155



"Discharge/Tributary Input Data for Segment 3"
"Flow",   "cBOD5",  "TKN",    "DO",     "Temp"
"(mgd)",  "(mg/l)", "(mg/l)", "(mg/l)", "deg C"
0,        0,        0,        ,0,       0

"Incremental Flow Input Data for Segment 3"
"Flow",   "cBOD5",  "TKN",    "DO",     "Temp"
"(mgd)",  "(mg/l)", "(mg/l)", "(mg/l)", "deg C"
3.647054,2,         0,        ,9.006,   15

"Hydraulic Information for Segment 3"
"Length","Width",   "Depth",  "Velocity"
"(mi)",   "(ft)",   "(ft)",   "(ft/sec)"
2.72,     149.999,  .658,     .209

"Initial Mix Values for Segment 3"
"Flow",   "DO",     "cBOD",   "nBOD",   "DOSat",  "Temp"
"(mgd)",  "(mg/l)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"
102.3024,8.999,     5,        .149,     10.006,   15.02444

"Rate Constants for Segment 3. - (All units Per Day)"
"k1",   "k1@T", "k2",    "k2@T", "kn",   "kn@T", "BD",   "BD@T"
.3,     .239,   4.412,   3.921,  .15,    .102,   0,      0

"Output for Segment 3"
"Segment starts at "
"Total", "Segm."
"Dist.", "Dist.",  "DO",     "cBOD",   "nBOD"
"(mi)",  "(mi)",   "(mg/l)", "(mg/l)", "(mg/l)"
6.5,     0,        8.999,    5,        .149
6.6,     .1,       9.006,    5,        .149
6.7,     .2,       9.006,    5,        .149
6.8,     .3,       9.006,    5,        .149
6.9,     .4,       9.006,    5,        .149
7,       .5,       9.006,    5,        .149
7.1,     .6,       9.006,    5,        .149
7.2,     .7,       9.006,    5,        .149
7.3,     .8,       9.006,    5,        .149
7.4,     .9,       9.006,    5,        .149
7.5,     1,        9.006,    5,        .149
7.6,     1.1,      9.006,    5,        .149
7.7,     1.2,      9.006,    5,        .149
7.8,     1.3,      9.006,    5,        .149
7.9,     1.4,      9.006,    5,        .149
8,       1.5,      9.006,    5,        .149
8.1,     1.6,      9.006,    5,        .149
8.2,     1.7,      9.006,    5,        .149
8.3,     1.8,      9.006,    5,        .149
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8.4,      1.9,      9.006,    5,          .149
8.5,      2,        9.006,    5,          .149
8.6,      2.1,      9.006,    5,          .149
8.7,      2.2,      9.006,    5,          .149
8.8,      2.3,      9.006,    5,          .149
8.9,      2.4,      9.006,    5,          .149
9,        2.5,      9.006,    5,          .149
9.1,      2.6,      9.006,    5,          .149
9.2,      2.7,      9.006,    5,          .149
9.22,     2.72,     9.006,    5,          .149



"Discharge/Tributary Input Data for Segment 4"
"Flow",   "cBOD5",  "TKN",    "DO",       "Temp"
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"
2.234,    2,        0,        ,9.015,    15

"Incremental Flow Input Data for Segment 4"
"Flow",   "cBOD5",  "TKN",    "DO",       "Temp"
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"
1.11143, 2,        0,        ,9.011,    15

"Hydraulic Information for Segment 4"
"Length","Width",  "Depth",  "Velocity"
"(mi)",  "(ft)",   "(ft)",   "(ft/sec)"
.53,      150,      1.651249, .8675447

"Initial Mix Values for Segment 4"
"Flow",   "DO",     "cBOD",   "nBOD",    "DOSat",   "Temp"
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"
105.6479,9.006,    5,        .144,      10.012,    15.02366

"Rate Constants for Segment 4. - (All units Per Day)"
"k1",   "k1@T", "k2",    "k2@T", "kn",   "kn@T", "BD",   "BD@T"
.5,     .398,   11.321, 10.06,  .25,    .17,    0,      0

"Output for Segment 4"
"Segment starts at UT RAPIDAN RIVER"
"Total", "Segm."
"Dist.", "Dist.",  "DO",     "cBOD",   "nBOD"
"(mi)",  "(mi)",   "(mg/l)", "(mg/l)", "(mg/l)"
9.22,     0,        9.006,    5,          .144
9.32,     .1,       9.011,    5,          .144
9.42,     .2,       9.011,    5,          .144
9.52,     .3,       9.011,    5,          .144
9.62,     .4,       9.011,    5,          .144
9.72,     .5,       9.011,    5,          .144
9.75,     .53,      9.011,    5,          .144



"END OF FILE"
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2.c

REGIONAL MODELING SYSTEM VERSION 4.0
Model Input File for the Discharge to RAPIDAN RIVER.

File Information

File Name:	I:\althompson\Permit Documents\PERMITS IN PROGRESS\Wilderness S
Date Modified:	April 06, 2006

Water Quality Standards Information

Stream Name:	RAPIDAN RIVER
River Basin:	Rappahannock River Basin
Section:	4
Class:	III - Nontidal Waters (Coastal and Piedmont)
Special Standards:	none

Background Flow Information

Gauge Used:	01667500
Gauge Drainage Area:	472 Sq.Mi.
Gauge 7Q10 Flow:	13.4 MGD
Headwater Drainage Area:	640 Sq.Mi.
Headwater 7Q10 Flow:	16.169 MGD (Net; includes Withdrawals/Discharges)
Withdrawal/Discharges:	-2 MGD
Incremental Flow in Segments:	2.838983E-02 MGD/Sq.Mi.

Background Water Quality

Background Temperature:	22 Degrees C
Background cBOD5:	2 mg/l
Background TKN:	0 mg/l
Background D.O.:	7.845246 mg/l

Model Segmentation

Number of Segments:	4
Model Start Elevation:	175 ft above MSL
Model End Elevation:	120 ft above MSL

2.0

REGIONAL MODELING SYSTEM VERSION 4.0
Model Input File for the Discharge to RAPIDAN RIVER.

Segment Information for Segment 1

Definition Information

Segment Definition:	A discharge enters.
Discharge Name:	WILDERNESS WWTP
VPDES Permit No.:	

Discharger Flow Information

Flow:	2 MGD
cBOD5:	8 mg/l
TKN:	3 mg/l
D.O.:	6.5 mg/l
Temperature:	22 Degrees C

Geographic Information

Segment Length:	0.9 miles
Upstream Drainage Area:	640 Sq.Mi.
Downstream Drainage Area:	662 Sq.Mi.
Upstream Elevation:	175 Ft.
Downstream Elevation:	172 Ft.

Hydraulic Information

Segment Width:	200 Ft.
Segment Depth:	0.833 Ft.
Segment Velocity:	0.183 Ft./Sec.
Segment Flow:	18.169 MGD
Incremental Flow:	0.625 MGD (Applied at end of segment.)

Channel Information

Cross Section:	Rectangular
Character:	Mostly Straight
Pool and Riffle:	Yes
Percent Pools:	50
Percent Riffles:	50
Pool Depth:	1 Ft.
Riffle Depth:	0.5 Ft.
Bottom Type:	Large Rock
Sludge:	None
Plants:	Few
Algae:	None

REGIONAL MODELING SYSTEM VERSION 4.0

Model Input File for the Discharge to RAPIDAN RIVER.

Segment Information for Segment 2

Definition Information

Segment Definition:	A tributary enters.
Tributary Name:	FLAT RUN

Tributary Flow Information

Flow:	0.6463 MGD
cBOD5:	2 mg/l
TKN:	0 mg/l
D.O.:	7.846 mg/l
Temperature:	22 Degrees C

Geographic Information

Segment Length:	5.6 miles
Upstream Drainage Area:	662 Sq.Mi.
Downstream Drainage Area:	685 Sq.Mi.
Upstream Elevation:	172 Ft.
Downstream Elevation:	150 Ft.

Hydraulic Information

Segment Width:	200.001 Ft.
Segment Depth:	0.646 Ft.
Segment Velocity:	0.168 Ft./Sec.
Segment Flow:	18.815 MGD
Incremental Flow:	0.653 MGD (Applied at end of segment.)

Channel Information

Cross Section:	Rectangular
Character:	Mostly Straight
Pool and Riffle:	No
Bottom Type:	Large Rock
Sludge:	None
Plants:	Few
Algae:	None

REGIONAL MODELING SYSTEM VERSION 4.0

Model Input File for the Discharge to RAPIDAN RIVER.

Segment Information for Segment 3

Definition Information

Segment Definition:	A significant change occurs.

Geographic Information

Segment Length:	2.72 miles
Upstream Drainage Area:	685 Sq.Mi.
Downstream Drainage Area:	692 Sq.Mi.
Upstream Elevation:	150 Ft.
Downstream Elevation:	130 Ft.

Hydraulic Information

Segment Width:	150.002 Ft.
Segment Depth:	0.672 Ft.
Segment Velocity:	0.212 Ft./Sec.
Segment Flow:	18.815 MGD
Incremental Flow:	0.199 MGD (Applied at end of segment.)

Channel Information

Cross Section:	Rectangular
Character:	Moderately Meandering
Pool and Riffle:	Yes
Percent Pools:	50
Percent Riffles:	50
Pool Depth:	1 Ft.
Riffle Depth:	0.35 Ft.
Bottom Type:	Large Rock
Sludge:	None
Plants:	Few
Algae:	None

REGIONAL MODELING SYSTEM VERSION 4.0

Model Input File for the Discharge to RAPIDAN RIVER.

Segment Information for Segment 4

Definition Information

Segment Definition:	A tributary enters.
Tributary Name:	UT RAPIDAN RIVER

Tributary Flow Information

Flow:	0.4 MGD
cBOD5:	2 mg/l
TKN:	0 mg/l
D.O.:	7.858 mg/l
Temperature:	22 Degrees C

Geographic Information

Segment Length:	0.53 miles
Upstream Drainage Area:	692 Sq.Mi.
Downstream Drainage Area:	693 Sq.Mi.
Upstream Elevation:	130 Ft.
Downstream Elevation:	120 Ft.

Hydraulic Information

Segment Width:	150.001 Ft.
Segment Depth:	0.52 Ft.
Segment Velocity:	0.272 Ft./Sec.
Segment Flow:	19.215 MGD
Incremental Flow:	0.028 MGD (Applied at end of segment.)

Channel Information

Cross Section:	Rectangular
Character:	Mostly Straight
Pool and Riffle:	No
Bottom Type:	Large Rock
Sludge:	None
Plants:	Light
Algae:	None

"Model Run For I:\althompson\Permit Documents\PERMITS IN PROGRESS\Wilderness STP\2006 Reissuance\Wilderness_2_8_3_65update_flow.mod On 4/6/2006 6:43:37 AM"

"Model is for RAPIDAN RIVER."
"Model starts at the WILDERNESS WWTP discharge."

"Background Data"

"7Q10"	"cBOD5"	"TKN"	"DO"	"Temp"
"(mgd)"	"(mg/l)"	"(mg/l)"	"(mg/l)"	"deg C"
16.169,	2,	0,	7.845,	22

"Discharge/Tributary Input Data for Segment 1"

"Flow"	"cBOD5"	"TKN"	"DO"	"Temp"
"(mgd)"	"(mg/l)"	"(mg/l)"	"(mg/l)"	"deg C"
2,	8,	3,	,6.5,	22

"Hydraulic Information for Segment 1"

"Length"	"Width"	"Depth"	"Velocity"
"(mi)"	"(ft)"	"(ft)"	"(ft/sec)"
.9,	200,	.833,	.183

"Initial Mix Values for Segment 1"

"Flow"	"DO"	"cBOD"	"nBOD"	"DOSat"	"Temp"
"(mgd)"	"(mg/l)"	"(mg/l)"	"(mg/l)"	"(mg/l)"	"deg C"
18.169,	7.697,	6.651,	0,	8.717,	22

"Rate Constants for Segment 1. - (All units Per Day)"

"k1",	"k1@T",	"k2",	"k2@T",	"kn",	"kn@T",	"BD",	"BD@T"
.3,	.329,	2,	2.097,	.15,	.175,	0,	0

"Output for Segment 1"
"Segment starts at WILDERNESS WWTP"

"Total", "Dist."	"Segm." "Dist."	"DO"	"cBOD"	"nBOD"
"(mi)"	"(mi)"	"(mg/l)"	"(mg/l)"	"(mg/l)"
0,	0,	7.697,	6.651,	0
.1,	.1,	7.696,	6.578,	0
.2,	.2,	7.696,	6.506,	0
.3,	.3,	7.696,	6.435,	0
.4,	.4,	7.697,	6.365,	0
.5,	.5,	7.699,	6.295,	0
.6,	.6,	7.701,	6.226,	0
.7,	.7,	7.704,	6.158,	0
.8,	.8,	7.708,	6.091,	0
.9,	.9,	7.712,	6.024,	0

"Discharge/Tributary Input Data for Segment 2"

"Flow"	"cBOD5"	"TKN"	"DO"	"Temp"
"(mgd)"	"(mg/l)"	"(mg/l)"	"(mg/l)"	"deg C"
.6463,	2,	0,	,7.846,	22

"Incremental Flow Input Data for Segment 2"

"Flow"	"cBOD5"	"TKN"	"DO"	"Temp"
"(mgd)"	"(mg/l)"	"(mg/l)"	"(mg/l)"	"deg C"
.625,	2,	0,	,7.849,	22

"Hydraulic Information for Segment 2"

"Length"	"Width"	"Depth"	"Velocity"
"(mi)"	"(ft)"	"(ft)"	"(ft/sec)"
5.6,	200.001,	.646,	.168

"Initial Mix Values for Segment 2"

"Flow",	"DO",	"cBOD",	"nBOD",	"DOSat",	"Temp"
"(mgd)",	"(mg/l)",	"(mg/l)",	"(mg/l)",	"(mg/l)",	"deg C"
19.4403,	7.721,	5.957,	0,	8.721,	22

"Rate Constants for Segment 2. - (All units Per Day)"

"k1",	"k1@T",	"k2",	"k2@T",	"kn",	"kn@T",	"BD",	"BD@T"
.5,	.548,	2.357,	2.472,	.25,	.292,	0,	0

"Output for Segment 2"
"Segment starts at FLAT RUN"

"Total" "Dist.",	"Segm." "Dist.",	"DO",	"cBOD",	"nBOD"
"(mi)",	"(mi)",	"(mg/l)",	"(mg/l)",	"(mg/l)"
.9,	0,	7.721,	5.957,	0
1,	.1,	7.695,	5.839,	0
1.1,	.2,	7.673,	5.724,	0
1.2,	.3,	7.655,	5.611,	0
1.3,	.4,	7.641,	5.5,	0
1.4,	.5,	7.63,	5.391,	0
1.5,	.6,	7.622,	5.285,	0
1.6,	.7,	7.617,	5.181,	0
1.7,	.8,	7.614,	5.079,	0
1.8,	.9,	7.613,	5,	0
1.9,	1,	7.708,	5,	0
2,	1.1,	7.795,	5,	0
2.1,	1.2,	7.849,	5,	0
2.2,	1.3,	7.849,	5,	0
2.3,	1.4,	7.849,	5,	0
2.4,	1.5,	7.849,	5,	0
2.5,	1.6,	7.849,	5,	0
2.6,	1.7,	7.849,	5,	0
2.7,	1.8,	7.849,	5,	0
2.8,	1.9,	7.849,	5,	0
2.9,	2,	7.849,	5,	0
3,	2.1,	7.849,	5,	0
3.1,	2.2,	7.849,	5,	0
3.2,	2.3,	7.849,	5,	0
3.3,	2.4,	7.849,	5,	0
3.4,	2.5,	7.849,	5,	0
3.5,	2.6,	7.849,	5,	0
3.6,	2.7,	7.849,	5,	0
3.7,	2.8,	7.849,	5,	0
3.8,	2.9,	7.849,	5,	0
3.9,	3,	7.849,	5,	0
4,	3.1,	7.849,	5,	0
4.1,	3.2,	7.849,	5,	0
4.2,	3.3,	7.849,	5,	0
4.3,	3.4,	7.849,	5,	0
4.4,	3.5,	7.849,	5,	0
4.5,	3.6,	7.849,	5,	0
4.6,	3.7,	7.849,	5,	0
4.7,	3.8,	7.849,	5,	0
4.8,	3.9,	7.849,	5,	0
4.9,	4,	7.849,	5,	0
5,	4.1,	7.849,	5,	0
5.1,	4.2,	7.849,	5,	0
5.2,	4.3,	7.849,	5,	0
5.3,	4.4,	7.849,	5,	0
5.4,	4.5,	7.849,	5,	0
5.5,	4.6,	7.849,	5,	0
5.6,	4.7,	7.849,	5,	0

5.7,	4.8,	7.849,	5,	0
5.8,	4.9,	7.849,	5,	0
5.9,	5,	7.849,	5,	0
6,	5.1,	7.849,	5,	0
6.1,	5.2,	7.849,	5,	0
6.2,	5.3,	7.849,	5,	0
6.3,	5.4,	7.849,	5,	0
6.4,	5.5,	7.849,	5,	0
6.5,	5.6,	7.849,	5,	0

"Discharge/Tributary Input Data for Segment 3"

"Flow",	"cBOD5",	"TKN",	"DO",	"Temp"
"(mgd)",	"(mg/l)",	"(mg/l)",	"(mg/l)",	"deg C"
0,	0,	0,	,0,	0

"Incremental Flow Input Data for Segment 3"

"Flow",	"cBOD5",	"TKN",	"DO",	"Temp"
"(mgd)",	"(mg/l)",	"(mg/l)",	"(mg/l)",	"deg C"
.653,	2,	0,	,7.855,	22

"Hydraulic Information for Segment 3"

"Length",	"Width",	"Depth",	"Velocity"
"(mi)",	"(ft)",	"(ft)",	"(ft/sec)"
2.72,	150.002,	.672,	.212

"Initial Mix Values for Segment 3"

"Flow",	"DO",	"cBOD",	"nBOD",	"DOSat",	"Temp"
"(mgd)",	"(mg/l)",	"(mg/l)",	"(mg/l)",	"(mg/l)",	"deg C"
20.0933,	7.849,	5,	0,	8.728,	22

"Rate Constants for Segment 3. - (All units Per Day)"

"k1",	"k1@T",	"k2",	"k2@T",	"kn",	"kn@T",	"BD",	"BD@T"
.3,	.329,	4.412,	4.626,	.15,	.175,	0,	0

"Output for Segment 3"
"Segment starts at "

"Total",	"Segm."			
"Dist.",	"Dist.",	"DO",	"cBOD",	"nBOD"
"(mi)",	"(mi)",	"(mg/l)",	"(mg/l)",	"(mg/l)"
6.5,	0,	7.849,	5,	0
6.6,	.1,	7.855,	5,	0
6.7,	.2,	7.855,	5,	0
6.8,	.3,	7.855,	5,	0
6.9,	.4,	7.855,	5,	0
7,	.5,	7.855,	5,	0
7.1,	.6,	7.855,	5,	0
7.2,	.7,	7.855,	5,	0
7.3,	.8,	7.855,	5,	0
7.4,	.9,	7.855,	5,	0
7.5,	1,	7.855,	5,	0
7.6,	1.1,	7.855,	5,	0
7.7,	1.2,	7.855,	5,	0
7.8,	1.3,	7.855,	5,	0
7.9,	1.4,	7.855,	5,	0
8,	1.5,	7.855,	5,	0
8.1,	1.6,	7.855,	5,	0
8.2,	1.7,	7.855,	5,	0
8.3,	1.8,	7.855,	5,	0
8.4,	1.9,	7.855,	5,	0
8.5,	2,	7.855,	5,	0

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8.6,      2.1,      7.855,    5,        0
8.7,      2.2,      7.855,    5,        0
8.8,      2.3,      7.855,    5,        0
8.9,      2.4,      7.855,    5,        0
9,        2.5,      7.855,    5,        0
9.1,      2.6,      7.855,    5,        0
9.2,      2.7,      7.855,    5,        0
9.22,     2.72,     7.855,    5,        0



"Discharge/Tributary Input Data for Segment 4"
"Flow",   "cBOD5",  "TKN",    "DO",     "Temp"
"(mgd)",  "(mg/l)", "(mg/l)", "(mg/l)", "deg C"
.4,       2,        0,        ,7.858,   22

"Incremental Flow Input Data for Segment 4"
"Flow",   "cBOD5",  "TKN",    "DO",     "Temp"
"(mgd)",  "(mg/l)", "(mg/l)", "(mg/l)", "deg C"
.199,     2,        0,        ,7.859,   22

"Hydraulic Information for Segment 4"
"Length","Width",   "Depth",  "Velocity"
"(mi)",   "(ft)",   "(ft)",   "(ft/sec)"
.53,      150.001,  .52,      .272

"Initial Mix Values for Segment 4"
"Flow",   "DO",     "cBOD",   "nBOD",   "DOSat",  "Temp"
"(mgd)",  "(mg/l)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"
20.6923,  7.855,    5,        0,        8.732,    22

"Rate Constants for Segment 4. - (All units Per Day)"
"k1",   "k1@T", "k2",    "k2@T", "kn",   "kn@T", "BD",   "BD@T"
.5,     .548,   11.321,  11.871, .25,    .292,   0,      0

"Output for Segment 4"
"Segment starts at UT RAPIDAN RIVER"
"Total",  "Segm."
"Dist.",  "Dist.",  "DO",     "cBOD",   "nBOD"
"(mi)",   "(mi)",   "(mg/l)", "(mg/l)", "(mg/l)"
9.22,     0,        7.855,    5,        0
9.32,     .1,       7.859,    5,        0
9.42,     .2,       7.859,    5,        0
9.52,     .3,       7.859,    5,        0
9.62,     .4,       7.859,    5,        0
9.72,     .5,       7.859,    5,        0
9.75,     .53,      7.859,    5,        0



"END OF FILE"
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"***SEASONAL RUN***"
"Wet Season is from December to May."
"Model Run For I:\althompson\Permit Documents\PERMITS IN PROGRESS\Wilderness STP\2006 Reissuance\Wilderness_2_8_3_65update_flow.mod On 4/6/2006 8:58:30 AM"

"Model is for RAPIDAN RIVER."
"Model starts at the WILDERNESS WWTP discharge."

"Background Data"
"7Q10", "cBOD5", "TKN", "DO", "Temp"
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"
88.5424, 2, 0, 8.999, 15

"Discharge/Tributary Input Data for Segment 1"
"Flow", "cBOD5", "TKN", "DO", "Temp"
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"
2, 20, 7, ,6.5, 17

"Hydraulic Information for Segment 1"
"Length","Width", "Depth", "Velocity"
"(mi)", "(ft)", "(ft)", "(ft/sec)"
.9, 200, 2.666138, .2627272

"Initial Mix Values for Segment 1"
"Flow", "DO", "cBOD", "nBOD", "DOSat", "Temp"
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"
90.5424, 8.944, 5.994, .383, 9.99, 15.04418

"Rate Constants for Segment 1. - (All units Per Day)"
"k1", "k1@T", "k2", "k2@T", "kn", "kn@T", "BD", "BD@T"
.3, .239, 2, 1.778, .15, .102, 0, 0

"Output for Segment 1"
"Segment starts at WILDERNESS WWTP"
"Total", "Segm."
"Dist.", "Dist.", "DO", "cBOD", "nBOD"
"(mi)", "(mi)", "(mg/l)", "(mg/l)", "(mg/l)"
0, 0, 8.944, 5.994, .383
.1, .1, 8.953, 5.961, .382
.2, .2, 8.962, 5.928, .381
.3, .3, 8.971, 5.895, .38
.4, .4, 8.979, 5.862, .379
.5, .5, 8.987, 5.83, .378
.6, .6, 8.991, 5.798, .377
.7, .7, 8.991, 5.766, .376
.8, .8, 8.991, 5.734, .375
.9, .9, 8.991, 5.702, .374

"Discharge/Tributary Input Data for Segment 2"
"Flow", "cBOD5", "TKN", "DO", "Temp"
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"
3.5392, 2, 0, ,9.004, 15

"Incremental Flow Input Data for Segment 2"
"Flow", "cBOD5", "TKN", "DO", "Temp"
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"
3.422536,2, 0, ,8.996, 15

"Hydraulic Information for Segment 2"
"Length","Width", "Depth", "Velocity"

"(mi)", "(ft)", "(ft)", "(ft/sec)"
5.6, 200.001, .646, .168

"Initial Mix Values for Segment 2"
"Flow", "DO", "cBOD", "nBOD", "DOSat", "Temp"
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"
97.5041, 8.992, 5.652, .347, 9.995, 15.04102

"Rate Constants for Segment 2. - (All units Per Day)"
"k1", "k1@T", "k2", "k2@T", "kn", "kn@T", "BD", "BD@T"
.5, .398, 2.357, 2.096, .25, .171, 0, 0

"Output for Segment 2"
"Segment starts at FLAT RUN"
"Total", "Segm."
"Dist.", "Dist.", "DO", "cBOD", "nBOD"
"(mi)", "(mi)", "(mg/l)", "(mg/l)", "(mg/l)"
.9, 0, 8.992, 5.652, .347
1, .1, 8.985, 5.571, .345
1.1, .2, 8.98, 5.491, .343
1.2, .3, 8.976, 5.412, .341
1.3, .4, 8.974, 5.334, .339
1.4, .5, 8.973, 5.257, .337
1.5, .6, 8.973, 5.181, .335
1.6, .7, 8.974, 5.107, .333
1.7, .8, 8.976, 5.034, .331
1.8, .9, 8.979, 5, .329
1.9, 1, 8.996, 5, .327
2, 1.1, 8.996, 5, .325
2.1, 1.2, 8.996, 5, .323
2.2, 1.3, 8.996, 5, .321
2.3, 1.4, 8.996, 5, .319
2.4, 1.5, 8.996, 5, .317
2.5, 1.6, 8.996, 5, .315
2.6, 1.7, 8.996, 5, .313
2.7, 1.8, 8.996, 5, .311
2.8, 1.9, 8.996, 5, .309
2.9, 2, 8.996, 5, .307
3, 2.1, 8.996, 5, .305
3.1, 2.2, 8.996, 5, .303
3.2, 2.3, 8.996, 5, .301
3.3, 2.4, 8.996, 5, .299
3.4, 2.5, 8.996, 5, .297
3.5, 2.6, 8.996, 5, .295
3.6, 2.7, 8.996, 5, .293
3.7, 2.8, 8.996, 5, .291
3.8, 2.9, 8.996, 5, .289
3.9, 3, 8.996, 5, .287
4, 3.1, 8.996, 5, .285
4.1, 3.2, 8.996, 5, .283
4.2, 3.3, 8.996, 5, .281
4.3, 3.4, 8.996, 5, .279
4.4, 3.5, 8.996, 5, .277
4.5, 3.6, 8.996, 5, .275
4.6, 3.7, 8.996, 5, .273
4.7, 3.8, 8.996, 5, .271
4.8, 3.9, 8.996, 5, .269
4.9, 4, 8.996, 5, .267
5, 4.1, 8.996, 5, .265
5.1, 4.2, 8.996, 5, .263
5.2, 4.3, 8.996, 5, .261
5.3, 4.4, 8.996, 5, .259
5.4, 4.5, 8.996, 5, .257

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5.5,      4.6,      8.996,    5,          .255
5.6,      4.7,      8.996,    5,          .253
5.7,      4.8,      8.996,    5,          .251
5.8,      4.9,      8.996,    5,          .249
5.9,      5,        8.996,    5,          .247
6,        5.1,      8.996,    5,          .245
6.1,      5.2,      8.996,    5,          .243
6.2,      5.3,      8.996,    5,          .241
6.3,      5.4,      8.996,    5,          .24
6.4,      5.5,      8.996,    5,          .239
6.5,      5.6,      8.996,    5,          .238



"Discharge/Tributary Input Data for Segment 3"
"Flow",   "cBOD5",  "TKN",    "DO",       "Temp"
"(mgd)",  "(mg/l)", "(mg/l)", "(mg/l)",   "deg C"
0,        0,        0,        ,0,         0

"Incremental Flow Input Data for Segment 3"
"Flow",   "cBOD5",  "TKN",    "DO",       "Temp"
"(mgd)",  "(mg/l)", "(mg/l)", "(mg/l)",   "deg C"
3.575865,2,         0,        ,9.003,     15

"Hydraulic Information for Segment 3"
"Length","Width",   "Depth",  "Velocity"
"(mi)",   "(ft)",   "(ft)",   "(ft/sec)"
2.72,     150.002,  .672,     .212

"Initial Mix Values for Segment 3"
"Flow",   "DO",     "cBOD",   "nBOD",   "DOSat",  "Temp"
"(mgd)",  "(mg/l)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"
101.0799,8.996,     5,        .23,      10.003,   15.03957

"Rate Constants for Segment 3. - (All units Per Day)"
"k1",   "k1@T", "k2",    "k2@T", "kn",   "kn@T", "BD",   "BD@T"
.3,     .239,   4.412,   3.922,  .15,    .102,   0,      0

"Output for Segment 3"
"Segment starts at "
"Total", "Segm."
"Dist.", "Dist.",  "DO",      "cBOD",    "nBOD"
"(mi)",  "(mi)",   "(mg/l)",  "(mg/l)",  "(mg/l)"
6.5,     0,        8.996,     5,         .23
6.6,     .1,       9.003,     5,         .229
6.7,     .2,       9.003,     5,         .228
6.8,     .3,       9.003,     5,         .227
6.9,     .4,       9.003,     5,         .226
7,       .5,       9.003,     5,         .225
7.1,     .6,       9.003,     5,         .224
7.2,     .7,       9.003,     5,         .223
7.3,     .8,       9.003,     5,         .222
7.4,     .9,       9.003,     5,         .221
7.5,     1,        9.003,     5,         .22
7.6,     1.1,      9.003,     5,         .219
7.7,     1.2,      9.003,     5,         .218
7.8,     1.3,      9.003,     5,         .217
7.9,     1.4,      9.003,     5,         .216
8,       1.5,      9.003,     5,         .215
8.1,     1.6,      9.003,     5,         .214
8.2,     1.7,      9.003,     5,         .213
8.3,     1.8,      9.003,     5,         .212
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8.4,      1.9,      9.003,    5,          .211
8.5,      2,        9.003,    5,          .21
8.6,      2.1,      9.003,    5,          .209
8.7,      2.2,      9.003,    5,          .208
8.8,      2.3,      9.003,    5,          .207
8.9,      2.4,      9.003,    5,          .206
9,        2.5,      9.003,    5,          .205
9.1,      2.6,      9.003,    5,          .204
9.2,      2.7,      9.003,    5,          .203
9.22,     2.72,     9.003,    5,          .203



"Discharge/Tributary Input Data for Segment 4"
"Flow",   "cBOD5",  "TKN",     "DO",      "Temp"
"(mgd)",  "(mg/l)", "(mg/l)",  "(mg/l)",  "deg C"
2.1904,   2,        0,         ,9.015,    15

"Incremental Flow Input Data for Segment 4"
"Flow",   "cBOD5",  "TKN",     "DO",      "Temp"
"(mgd)",  "(mg/l)", "(mg/l)",  "(mg/l)",  "deg C"
1.089735,2,         0,         ,9.008,    15

"Hydraulic Information for Segment 4"
"Length","Width",   "Depth",   "Velocity"
"(mi)",   "(ft)",   "(ft)",    "(ft/sec)"
.53,      150.001,  1.664336,  2.032944E-02

"Initial Mix Values for Segment 4"
"Flow",   "DO",     "cBOD",    "nBOD",    "DOSat",   "Temp"
"(mgd)",  "(mg/l)", "(mg/l)",  "(mg/l)",  "(mg/l)",  "deg C"
104.3601,9.003,     5,         .197,      10.009,    15.03833

"Rate Constants for Segment 4. - (All units Per Day)"
"k1",   "k1@T", "k2",    "k2@T", "kn",   "kn@T", "BD",   "BD@T"
.5,     .398,   11.321,  10.064, .25,    .171,   0,      0

"Output for Segment 4"
"Segment starts at UT RAPIDAN RIVER"
"Total", "Segm."
"Dist.", "Dist.",  "DO",      "cBOD",    "nBOD"
"(mi)",  "(mi)",   "(mg/l)",  "(mg/l)",  "(mg/l)"
9.22,    0,        9.003,     5,         .197
9.32,    .1,       9.008,     5,         .187
9.42,    .2,       9.008,     5,         .178
9.52,    .3,       9.008,     5,         .169
9.62,    .4,       9.008,     5,         .161
9.72,    .5,       9.008,     5,         .153
9.75,    .53,      9.008,     5,         .151



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Public Notice – Environmental Permit

PURPOSE OF NOTICE: To seek public comment on a draft permit from the Department of Environmental Quality that will allow the release of treated wastewater into a water body in Orange County, Virginia.

PUBLIC COMMENT PERIOD: XXX, 2011 to 5:00 p.m. on XXX, 2011

PERMIT NAME: Virginia Pollutant Discharge Elimination System Permit – Wastewater issued by DEQ, under the authority of the State Water Control Board

APPLICANT NAME, ADDRESS AND PERMIT NUMBER: Rapidan Service Authority, PO Box 148, Ruckersville, VA 22968, VA0083411

NAME AND ADDRESS OF FACILITY: Wilderness WWTP, 36075 Wilderness Shores Way, Locust Grove, VA 22508

PROJECT DESCRIPTION: Rapidan Service Authority has applied for a reissuance of a permit for the public Wilderness WWTP. The applicant proposes to release treated sewage wastewaters from residential areas at a rate of up to 2.0 million gallons per day into a water body. The sludge will be disposed by lad application by a licensed contractor. The facility proposes to release the treated sewage in the Rapidan River in Orange County in the Rappahannock watershed. A watershed is the land area drained by a river and its incoming streams. The permit will limit the following pollutants to amounts that protect water quality: pH, cBOD, Total Suspended Solids, Total Kjeldahl Nitrogen, E. coli, Total Residual Chlorine, Total Phosphorus, Total Nitrogen, Total Recoverable Copper and Total Recoverable Zinc.

This facility is subject to the requirements of 9 VAC 25-820 and has registered for coverage under the General VPDES Watershed Permit Regulation for Total Nitrogen and Total Phosphorus Discharges and Nutrient Trading in the Chesapeake Watershed in Virginia.

HOW TO COMMENT AND/OR REQUEST A PUBLIC HEARING: DEQ accepts comments and requests for public hearing by e-mail, fax or postal mail. All comments and requests must be in writing and be received by DEQ during the comment period. Submittals must include the names, mailing addresses and telephone numbers of the commenter/requester and of all persons represented by the commenter/requester. A request for public hearing must also include: 1) The reason why a public hearing is requested. 2) A brief, informal statement regarding the nature and extent of the interest of the requester or of those represented by the requestor, including how and to what extent such interest would be directly and adversely affected by the permit. 3) Specific references, where possible, to terms and conditions of the permit with suggested revisions. A public hearing may be held, including another comment period, if public response is significant, based on individual requests for a public hearing, and there are substantial, disputed issues relevant to the permit.

CONTACT FOR PUBLIC COMMENTS, DOCUMENT REQUESTS AND ADDITIONAL INFORMATION: The public may review the documents at the DEQ-Northern Regional Office by appointment, or may request electronic copies of the draft permit and fact sheet.
Name: Alison Thompson
Address: DEQ-Northern Regional Office, 13901 Crown Court, Woodbridge, VA 22193
Phone: (703) 583-3834 E-mail: Alison.Thompson@deq.virginia.gov Fax: (703) 583-3821

Public Notice – Environmental Permit

PURPOSE OF NOTICE: To seek public comment on a draft permit from the Department of Environmental Quality that will allow the release of treated wastewater into a water body in Orange County, Virginia.

PUBLIC COMMENT PERIOD: July 14, 2011 to 5:00 p.m. on August 15, 2011

PERMIT NAME: Virginia Pollutant Discharge Elimination System Permit – Wastewater issued by DEQ, under the authority of the State Water Control Board

APPLICANT NAME, ADDRESS AND PERMIT NUMBER: Rapidan Service Authority, PO Box 148, Ruckersville, VA 22968, VA0083411

NAME AND ADDRESS OF FACILITY: Wilderness WWTP, 36075 Wilderness Shores Way, Locust Grove, VA 22508

PROJECT DESCRIPTION: Rapidan Service Authority has applied for a reissuance of a permit for the public Wilderness WWTP. The applicant proposes to release treated sewage wastewaters from residential areas at a rate of up to 2.0 million gallons per day into a water body. The sludge will be disposed by lad application by a licensed contractor. The facility proposes to release the treated sewage in the Rapidan River in Orange County in the Rappahannock watershed. A watershed is the land area drained by a river and its incoming streams. The permit will limit the following pollutants to amounts that protect water quality: pH, cBOD, Total Suspended Solids, Total Kjeldahl Nitrogen, E. coli, Total Residual Chlorine, Total Phosphorus, Total Nitrogen, Total Recoverable Copper and Total Recoverable Zinc.

This facility is subject to the requirements of 9 VAC 25-820 and has registered for coverage under the General VPDES Watershed Permit Regulation for Total Nitrogen and Total Phosphorus Discharges and Nutrient Trading in the Chesapeake Watershed in Virginia.

HOW TO COMMENT AND/OR REQUEST A PUBLIC HEARING: DEQ accepts comments and requests for public hearing by e-mail, fax or postal mail. All comments and requests must be in writing and be received by DEQ during the comment period. Submittals must include the names, mailing addresses and telephone numbers of the commenter/requester and of all persons represented by the commenter/requester. A request for public hearing must also include: 1) The reason why a public hearing is requested. 2) A brief, informal statement regarding the nature and extent of the interest of the requester or of those represented by the requestor, including how and to what extent such interest would be directly and adversely affected by the permit. 3) Specific references, where possible, to terms and conditions of the permit with suggested revisions. A public hearing may be held, including another comment period, if public response is significant, based on individual requests for a public hearing, and there are substantial, disputed issues relevant to the permit.

CONTACT FOR PUBLIC COMMENTS, DOCUMENT REQUESTS AND ADDITIONAL INFORMATION: The public may review the documents at the DEQ-Northern Regional Office by appointment, or may request electronic copies of the draft permit and fact sheet.
Name: Alison Thompson
Address: DEQ-Northern Regional Office, 13901 Crown Court, Woodbridge, VA 22193
Phone: (703) 583-3834 E-mail: Alison.Thompson@deq.virginia.gov Fax: (703) 583-3821

Revised 2/2003

State "Transmittal Checklist" to Assist in Targeting
Municipal and Industrial Individual NPDES Draft Permits for Review

Part I. State Draft Permit Submission Checklist

In accordance with the MOA established between the Commonwealth of Virginia and the United States Environmental Protection Agency, Region III, the Commonwealth submits the following draft National Pollutant Discharge Elimination System (NPDES) permit for Agency review and concurrence.

Facility Name: Wilderness WWTP
NPDES Permit Number: VA0083411
Permit Writer Name: Alison L. Thompson
Date: 4/4/2011

Major [X] **Minor** [ ] **Industrial** [ ] **Municipal** [X]

I.A. Draft Permit Package Submittal Includes:	**Yes**	**No**	**N/A**
1. Permit Application?	X		
2. Complete Draft Permit (for renewal or first time permit – entire permit, including boilerplate information)?	X		
3. Copy of Public Notice?	X		
4. Complete Fact Sheet?	X		
5. A Priority Pollutant Screening to determine parameters of concern?	X		
6. A Reasonable Potential analysis showing calculated WQBELs?	X		
7. Dissolved Oxygen calculations?	X		
8. Whole Effluent Toxicity Test summary and analysis?			X
9. Permit Rating Sheet for new or modified industrial facilities?			X

I.B. Permit/Facility Characteristics	**Yes**	**No**	**N/A**
1. Is this a new, or currently unpermitted facility?		X	
2. Are all permissible outfalls (including combined sewer overflow points, non-process water and storm water) from the facility properly identified and authorized in the permit?	X		
3. Does the fact sheet **or** permit contain a description of the wastewater treatment process?	X		
4. Does the review of PCS/DMR data for at least the last 3 years indicate significant non-compliance with the existing permit?		X	
5. Has there been any change in streamflow characteristics since the last permit was developed?		X	
6. Does the permit allow the discharge of new or increased loadings of any pollutants?		X	
7. Does the fact sheet **or** permit provide a description of the receiving water body(s) to which the facility discharges, including information on low/critical flow conditions and designated/existing uses?	X		
8. Does the facility discharge to a 303(d) listed water?	X		
a. Has a TMDL been developed and approved by EPA for the impaired water?	X		
b. Does the record indicate that the TMDL development is on the State priority list and will most likely be developed within the life of the permit?		X	
c. Does the facility discharge a pollutant of concern identified in the TMDL or 303(d) listed water?	X		
9. Have any limits been removed, or are any limits less stringent, than those in the current permit?	X		
10. Does the permit authorize discharges of storm water?		X	

I.B. Permit/Facility Characteristics – cont.	Yes	No	N/A
11. Has the facility substantially enlarged or altered its operation or substantially increased its flow or production? Under expansion from 0.715 to 2.0 MGD	X		
12. Are there any production-based, technology-based effluent limits in the permit?		X	
13. Do any water quality-based effluent limit calculations differ from the State's standard policies or procedures?		X	
14. Are any WQBELs based on an interpretation of narrative criteria?		X	
15. Does the permit incorporate any variances or other exceptions to the State's standards or regulations?		X	
16. Does the permit contain a compliance schedule for any limit or condition?		X	
17. Is there a potential impact to endangered/threatened species or their habitat by the facility's discharge(s)?		X	
18. Have impacts from the discharge(s) at downstream potable water supplies been evaluated?	X		
19. Is there any indication that there is significant public interest in the permit action proposed for this facility?		X	
20. Have previous permit, application, and fact sheet been examined?	X		

Part II. NPDES Draft Permit Checklist

Region III NPDES Permit Quality Checklist – for POTWs
(To be completed and included in the record only for POTWs)

II.A. Permit Cover Page/Administration	Yes	No	N/A
1. Does the fact sheet or permit describe the physical location of the facility, including latitude and longitude (not necessarily on permit cover page)?	X		
2. Does the permit contain specific authorization-to-discharge information (from where to where, by whom)?	X		

II.B. Effluent Limits – General Elements	Yes	No	N/A
1. Does the fact sheet describe the basis of final limits in the permit (e.g., that a comparison of technology and water quality-based limits was performed, and the most stringent limit selected)?	X		
2. Does the fact sheet discuss whether "antibacksliding" provisions were met for any limits that are less stringent than those in the previous NPDES permit?	X		

II.C. Technology-Based Effluent Limits (POTWs)	Yes	No	N/A
1. Does the permit contain numeric limits for ALL of the following: BOD (or alternative, e.g., CBOD, COD, TOC), TSS, and pH?	X		
2. Does the permit require at least 85% removal for BOD (or BOD alternative) and TSS (or 65% for equivalent to secondary) consistent with 40 CFR Part 133?	X		
a. If no, does the record indicate that application of WQBELs, or some other means, results in more stringent requirements than 85% removal or that an exception consistent with 40 CFR 133.103 has been approved?	X		
3. Are technology-based permit limits expressed in the appropriate units of measure (e.g., concentration, mass, SU)?	X		
4. Are permit limits for BOD and TSS expressed in terms of both long term (e.g., average monthly) and short term (e.g., average weekly) limits?	X		
5. Are any concentration limitations in the permit less stringent than the secondary treatment requirements (30 mg/l BOD5 and TSS for a 30-day average and 45 mg/l BOD5 and TSS for a 7-day average)?		X	
a. If yes, does the record provide a justification (e.g., waste stabilization pond, trickling filter, etc.) for the alternate limitations?			X

II.D. Water Quality-Based Effluent Limits	Yes	No	N/A
1. Does the permit include appropriate limitations consistent with 40 CFR 122.44(d) covering State narrative and numeric criteria for water quality?	X		
2. Does the fact sheet indicate that any WQBELs were derived from a completed and EPA approved TMDL? E. coli	X		
3. Does the fact sheet provide effluent characteristics for each outfall?	X		
4. Does the fact sheet document that a "reasonable potential" evaluation was performed?	X		
a. If yes, does the fact sheet indicate that the "reasonable potential" evaluation was performed in accordance with the State's approved procedures?	X		
b. Does the fact sheet describe the basis for allowing or disallowing in-stream dilution or a mixing zone?	X		
c. Does the fact sheet present WLA calculation procedures for all pollutants that were found to have "reasonable potential"?	X		
d. Does the fact sheet indicate that the "reasonable potential" and WLA calculations accounted for contributions from upstream sources (i.e., do calculations include ambient/background concentrations)?	X		
e. Does the permit contain numeric effluent limits for all pollutants for which "reasonable potential" was determined?	X		

II.D. Water Quality-Based Effluent Limits – cont.	Yes	No	N/A
5. Are all final WQBELs in the permit consistent with the justification and/or documentation provided in the fact sheet?	X		
6. For all final WQBELs, are BOTH long-term AND short-term effluent limits established?	X		
7. Are WQBELs expressed in the permit using appropriate units of measure (e.g., mass, concentration)?	X		
8. Does the record indicate that an "antidegradation" review was performed in accordance with the State's approved antidegradation policy?	X		

II.E. Monitoring and Reporting Requirements	Yes	No	N/A
1. Does the permit require at least annual monitoring for all limited parameters and other monitoring as required by State and Federal regulations?	X		
a. If no, does the fact sheet indicate that the facility applied for and was granted a monitoring waiver, AND, does the permit specifically incorporate this waiver?			
2. Does the permit identify the physical location where monitoring is to be performed for each outfall?	X		
3. Does the permit require at least annual influent monitoring for BOD (or BOD alternative) and TSS to assess compliance with applicable percent removal requirements?		X	
4. Does the permit require testing for Whole Effluent Toxicity?	X		

II.F. Special Conditions	Yes	No	N/A
1. Does the permit include appropriate biosolids use/disposal requirements?	X		
2. Does the permit include appropriate storm water program requirements?			X

II.F. Special Conditions – cont.	Yes	No	N/A
3. If the permit contains compliance schedule(s), are they consistent with statutory and regulatory deadlines and requirements?			X
4. Are other special conditions (e.g., ambient sampling, mixing studies, TIE/TRE, BMPs, special studies) consistent with CWA and NPDES regulations?	X		
5. Does the permit allow/authorize discharge of sanitary sewage from points other than the POTW outfall(s) or CSO outfalls [i.e., Sanitary Sewer Overflows (SSOs) or treatment plant bypasses]?		X	
6. Does the permit authorize discharges from Combined Sewer Overflows (CSOs)?		X	
a. Does the permit require implementation of the "Nine Minimum Controls"?			X
b. Does the permit require development and implementation of a "Long Term Control Plan"?			X
c. Does the permit require monitoring and reporting for CSO events?			X
7. Does the permit include appropriate Pretreatment Program requirements?	X		

II.G. Standard Conditions	Yes	No	N/A
1. Does the **permit** contain all 40 CFR 122.41 standard conditions or the State equivalent (or more stringent) conditions?	X		

List of Standard Conditions – 40 CFR 122.41

Duty to comply	Property rights	Reporting Requirements
Duty to reapply	Duty to provide information	Planned change
Need to halt or reduce activity not a defense	Inspections and entry	Anticipated noncompliance
Duty to mitigate	Monitoring and records	Transfers
Proper O & M	Signatory requirement	Monitoring reports
Permit actions	Bypass	Compliance schedules
	Upset	24-Hour reporting
		Other non-compliance

2. Does the permit contain the additional standard condition (or the State equivalent or more stringent conditions) for POTWs regarding notification of new introduction of pollutants and new industrial users [40 CFR 122.42(b)]?	X		

Part III. Signature Page

Based on a review of the data and other information submitted by the permit applicant, and the draft permit and other administrative records generated by the Department/Division and/or made available to the Department/Division, the information provided on this checklist is accurate and complete, to the best of my knowledge.

Name	Alison L. Thompson
Title	Water Permits Technical Reviewer
Signature	
Date	4/4/11

Hardness @ Wilderness WWTP

Date	$mgCaCo_3/L$
6-Jun	24
7-Jun	32
8-Jun	55
10-Jun	82
13-Jun	102
14-Jun	103
16-Jun	100
17-Jun	100
20-Jun	120
21-Jun	110
22-Jun	120
23-Jun	122
24-Jun	130
28-Jun	120
29-Jun	120
30-Jun	122
1-Jul	120
5-Jul	120